THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXV. No. 1662.] LONDON, MARCH 19, 1895. [47TH YEAR. PRICE 6d.

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GUARANTEED FOR 5 YEARS.

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Will take a number of pennies, but cannot be jambed by the insertion of a second coin until the first is discharged.

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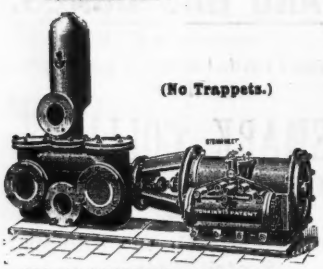

(No Trappets.)

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

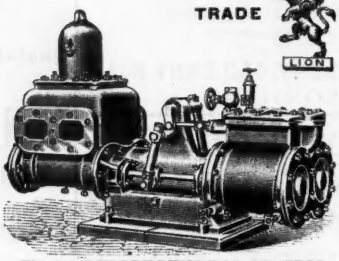

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

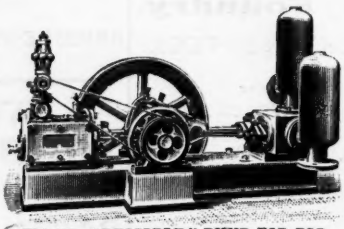

Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 703. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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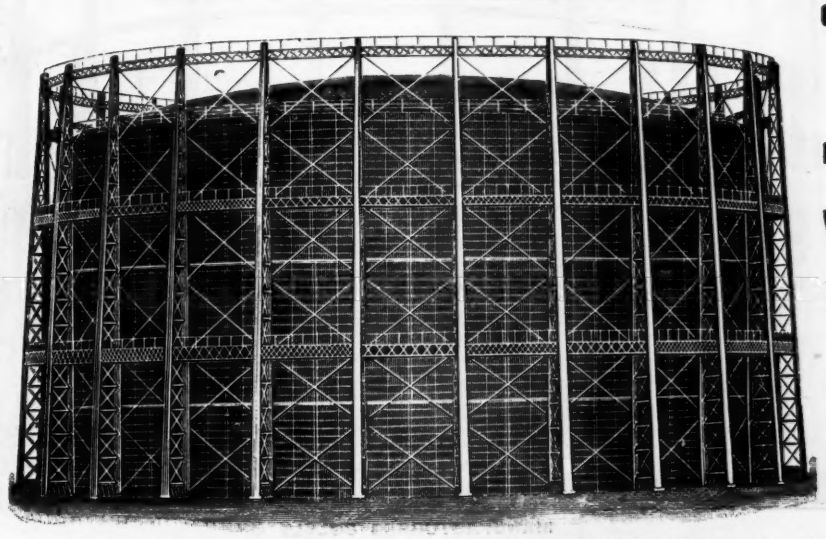

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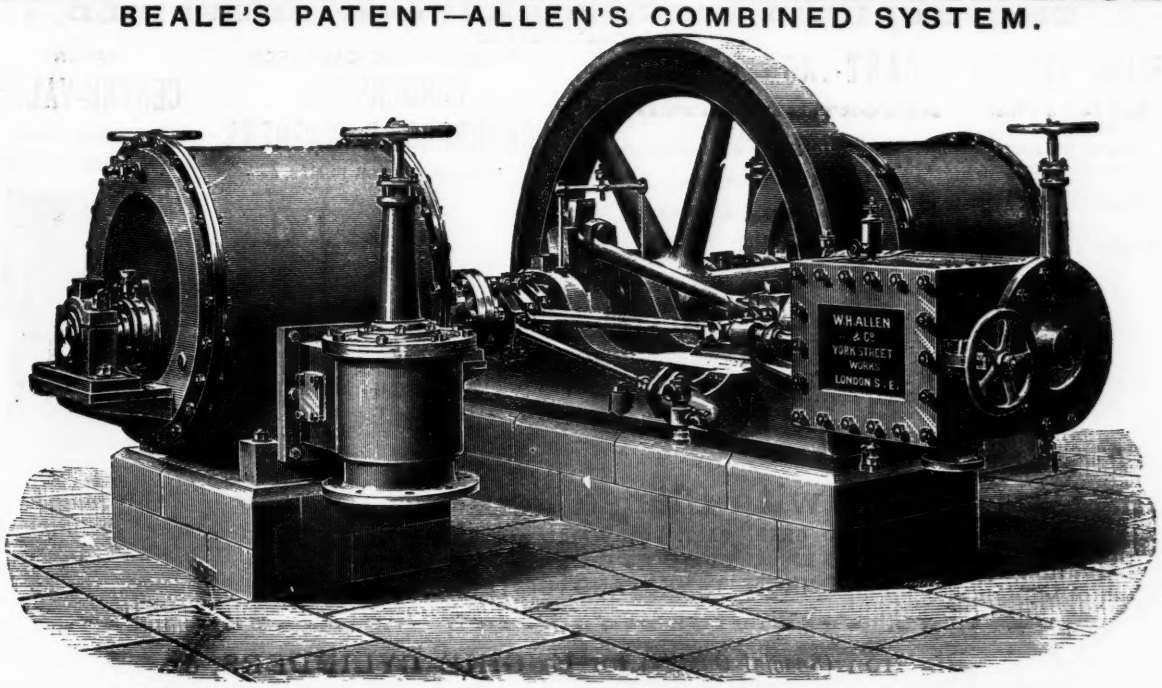

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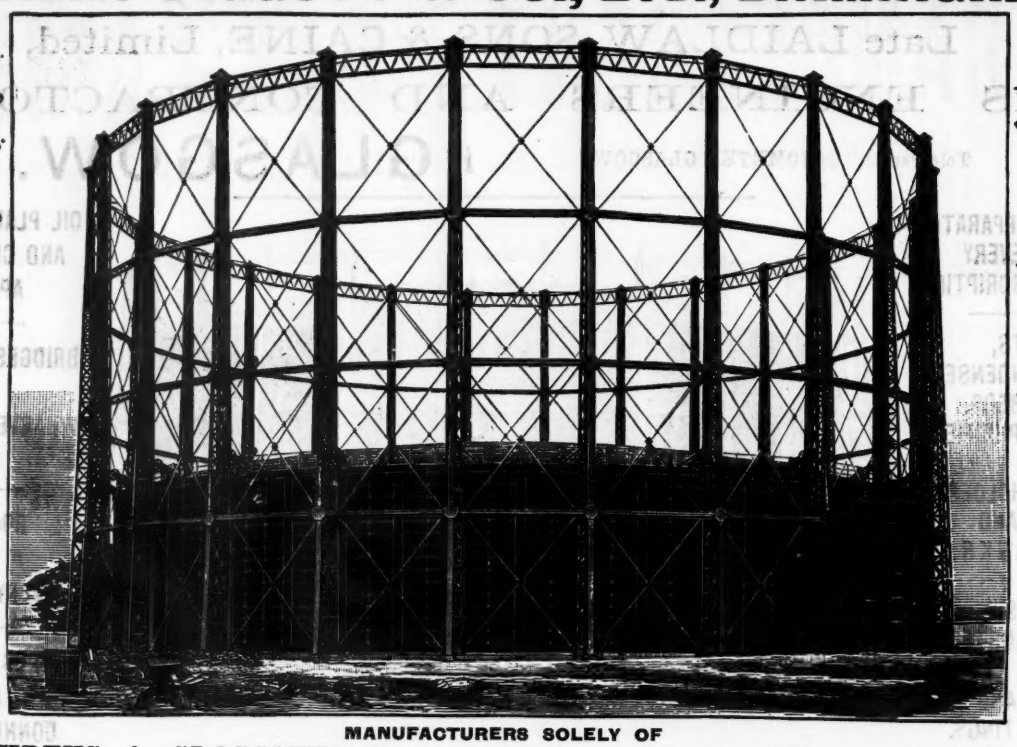

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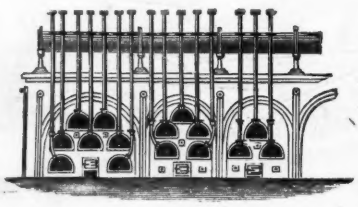

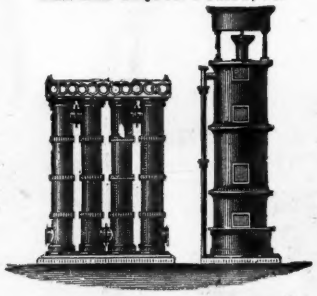

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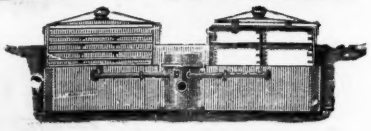

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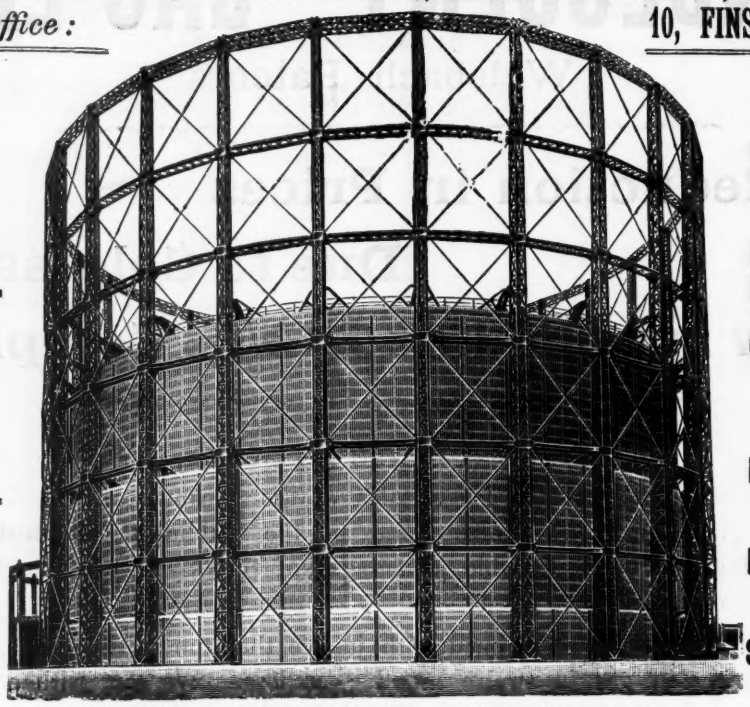

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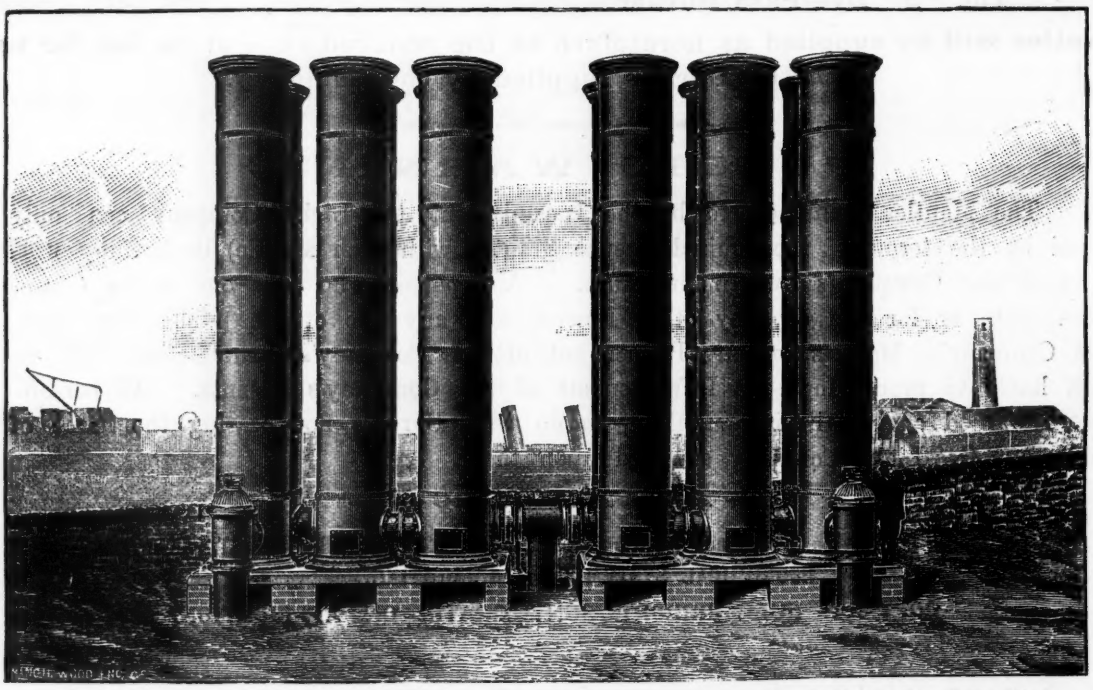

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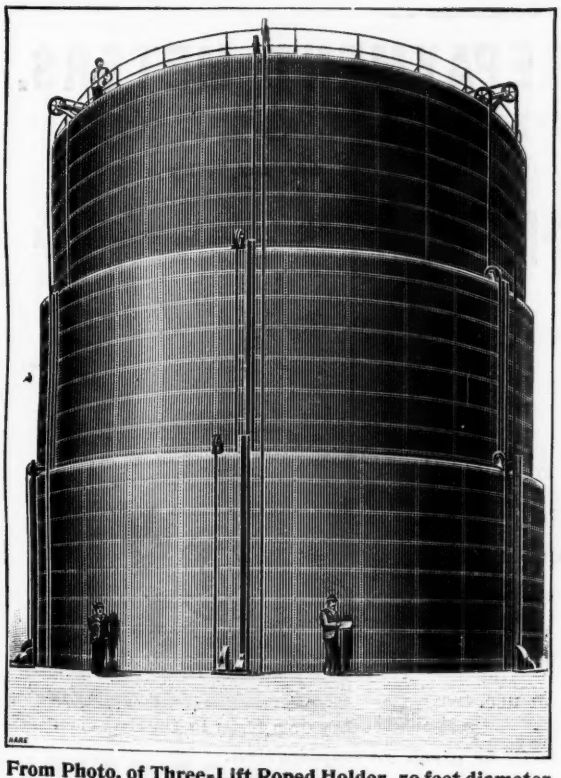

From Photo. of Three-Lift Roped Holder, 50 feet diameter by 18 feet deep each Lift. Erected at Sligo, 1894.

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THESE HOLDERS HAVE WORKED SUCCESSFULLY UNDER EVERY TEST TO WHICH THEY HAVE BEEN SUBJECTED SINCE 1889.

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Send for Catalogue if requiring increased Storage.

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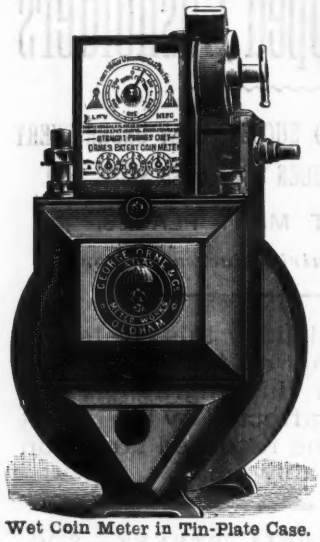

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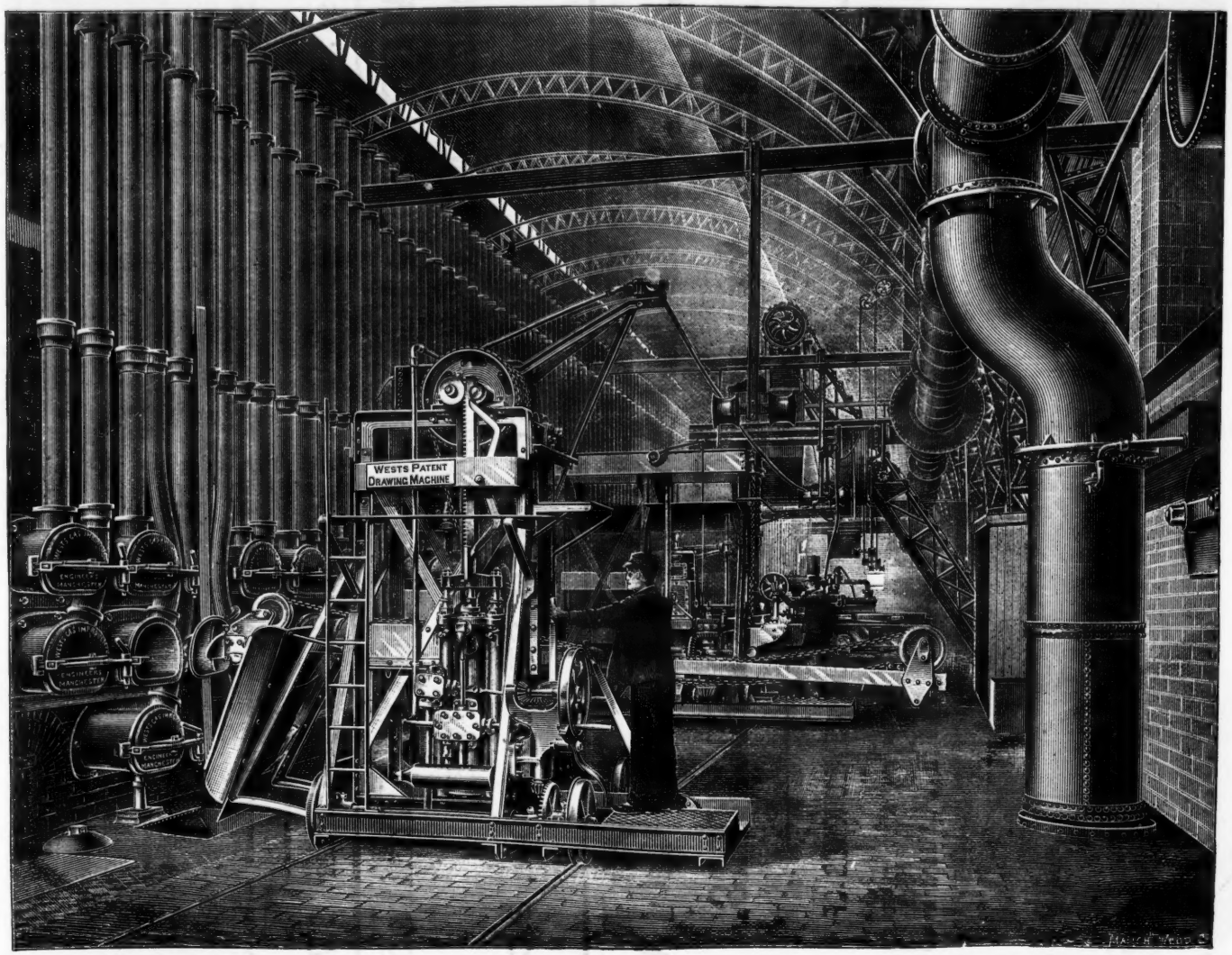

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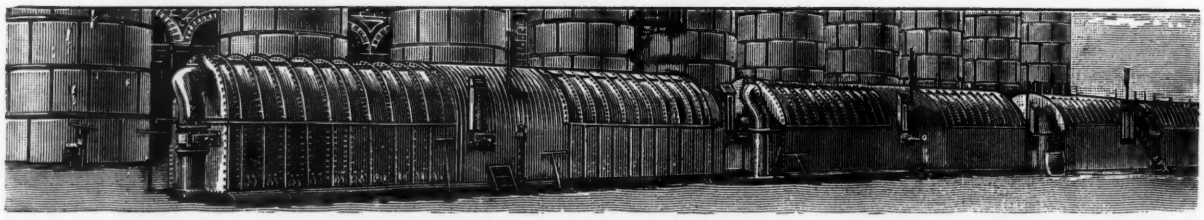
PATENT "STANDARD" WASHER-SCRUBBER

☞ **484** of these Machines (capable of dealing with **464,490,000** cubic feet of Gas daily) in use which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

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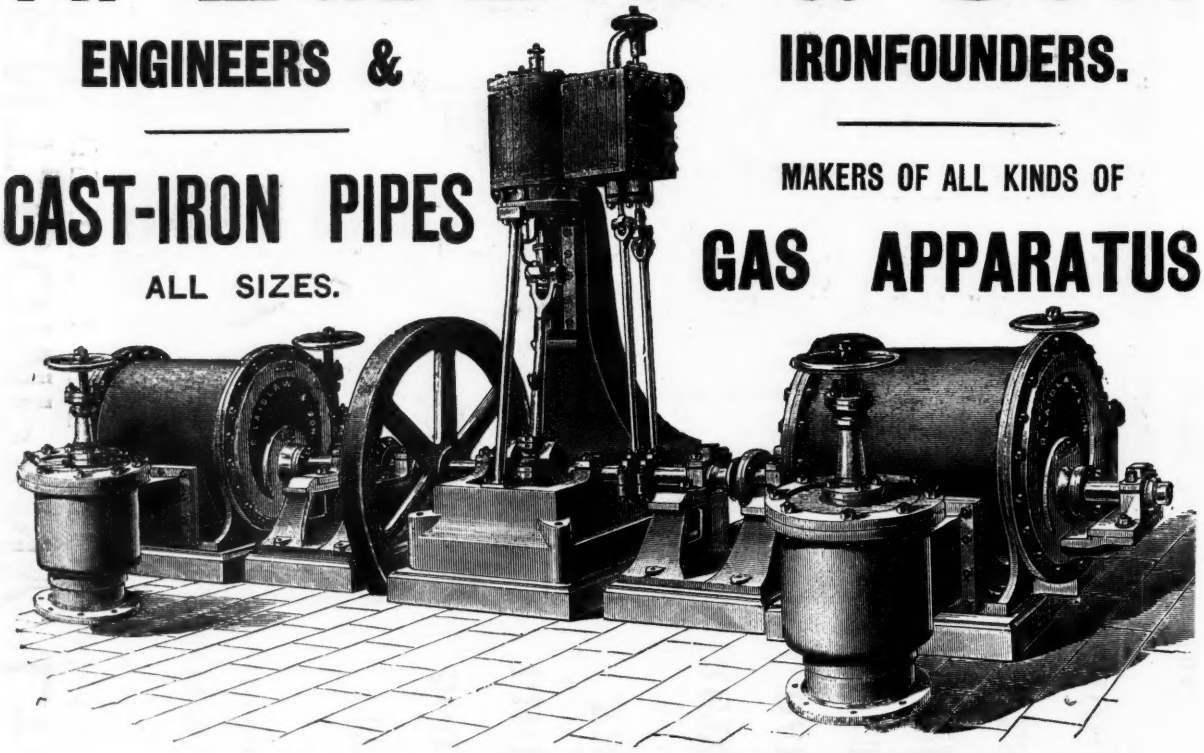

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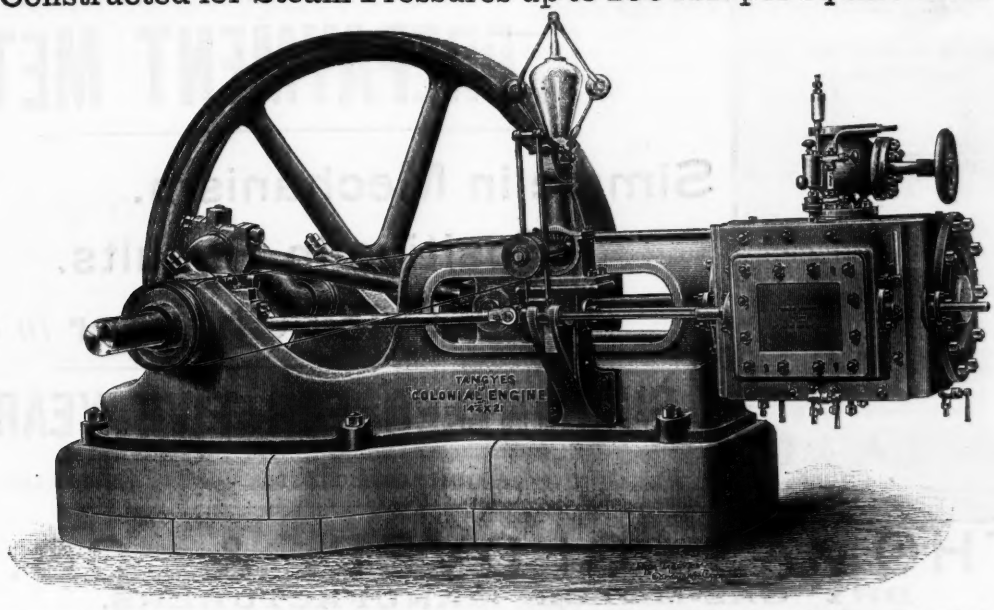
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



Tangyes' "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 21 in. size.

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HUNT'S **PATENT WASHER,** IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS, IT REQUIRES NO MOTIVE POWER

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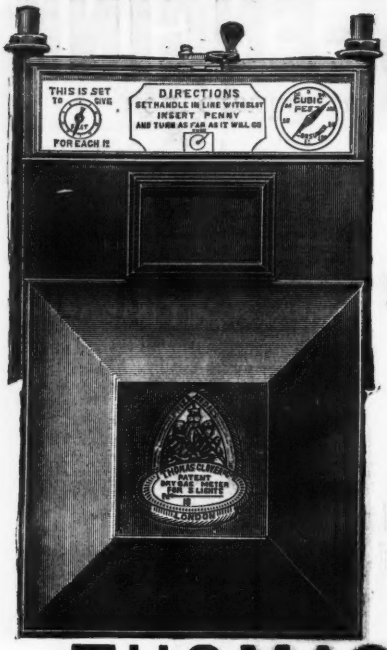

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EDITORIAL NOTES.

Colonel Makins on Profit-Sharing and Directorships.

THE calmly-reasoned reply of Colonel Makins, which appears in our "Correspondence" columns to-day, to Mr. Livesey's last letter, carries the discussion upon the "workman-director" proposal several points farther. We shall not attempt to deal here with those passages of it which are addressed directly to Mr. Livesey, but shall confine ourselves to the general question, and essay to define our own position in regard to it, which Colonel Makins has slightly misrepresented. The Governor of The Gaslight and Coke Company states that both Mr. Livesey and the writer of our leading article (of last week) "assume that the institution of 'workmen-directors' is "the necessary and natural development of the adoption "of profit-sharing;" and he pertinently asks, "Why?" It is quite true that Mr. Livesey now proposes this scheme as such a development; but, so far as we are concerned, the adoption of the definite article by Colonel Makins in this connection is hardly warranted by the tone of our comments upon the proposal hitherto. If our last week's editorial on the subject is carefully read, it will be noticed that we said nothing more on this head than that it is Mr. Livesey who declares the new development to be the natural outcome of what has been done before. Our own view all along has been that it is a natural development for which there is much to be said; but we have been particularly solicitous, even while showing what sort of case can be made out for it, to give every consideration to the views of those who, like Colonel Makins, are opposed to the idea. We admitted on the 26th ult. that "both positions are "strong;" and we owned that we were "not disposed to "ascribe superiority at all points to either." We are still open to conviction. We do not regard Mr. Livesey's proposal as a question of life or death for the undertaking to which he seeks to adapt the idea. We are attracted by it, for many reasons which are not controverted in Colonel Makins's letter, and see no harm in its being tried.

It may be, as Colonel Makins declares, that the idea is an uncalled-for innovation, which could not be satisfactorily applied in practice. This is his opinion—a weighty one, we concede, but after all, only an *a priori* assumption. He does not really know, because he has not tried it; nor can he adduce any example in support of his view. He suggests that if the workmen-shareholders of the Company desire special representation on the Board, they can nominate and qualify a director; but this representative "could "not be, and ought not to be, at the same time an employee "of the Company, though he might be, or have been, a "working man employed elsewhere." Colonel Makins can hardly mean this seriously, because his suggested nominee would be destitute of the profit-sharing interest in the Company which Mr. Livesey poses as the fundamental qualification of such a director, while possessing every other class characteristic to which objection might reasonably be taken.

Colonel Makins states that the new development is an after-thought; and this is true. He can hardly mean to argue that after-thoughts are essentially bad, but only that they require justification. Quite so. But here again the strength of such justification is a matter of opinion. Mr. Livesey owned it was something that was said at a sitting of the Labour Commission which put the thought into his head; and he now holds that it is justifiable. Well, he has to justify it. We have said, before Colonel Makins, that Mr. Livesey must "convert his minority "into a majority" in order to give his scheme a fair chance. It is possible that the opposition on the South Metropolitan Board may have to be overcome by outside pressure. It may well be that if Mr. Livesey first succeeds in convincing competent and impartial outsiders at least of the feasibility of the experiment, his co-Directors and a sufficient majority of the shareholders who now oppose may be content to withdraw their objection. But they will always have the power of making their desires respected. Mr. Livesey, strong leader as he is, can do nothing with the South Metropolitan Company, and we are convinced will seek to do nothing, unless he is supported by the bulk of those in whose interests he acts. It is of the essence of the scheme in question that its operation should

not be tied to the will or the life of one man, though it is always one man who initiates.

One of the most notable things in Colonel Makins's letter is the admission that probably the employees of The Gaslight and Coke Company could have profit-sharing for the asking. But the Court will wait to be asked. How significant is this! We were under the impression that it is the function of Directors to direct, not to be directed. Is it quite a worthy attitude of a Board of Directors to leave their employees to say what is the best principle of rewarding the labour spent in the working of the undertaking? If so, it is an acknowledgment that the men know more than their masters; so that the admission of a few of them upon the Board would obviously be a highly desirable consummation. We do not wish to put any forced interpretation upon Colonel Makins's words; but, really, is it the good of the Company or the wishes of the employees that should be considered in the settling of a scheme of payment for services rendered? If the former, who but the Board of Directors should determine the matter?

The last two paragraphs of Colonel Makins's letter are fairly to the point. Unquestionably, it was a very unusual course for the South Metropolitan Chairman to take, when he asked the shareholders present at the extraordinary general meeting for an expression of opinion respecting a matter which was the cause of a divided Board. It can only be excused in view of the very exceptional circumstances. The counsels of the Board had been blurted out by somebody, and, as a consequence, were commented upon in a newspaper article. This rendered it necessary for Mr. Livesey to make a "clean breast" of it to the proprietors. The circumstance that it occurred in a Wharncliffe meeting also alters the complexion of Mr. Livesey's proceeding. As we take it, all shareholders are equal in a meeting of this character; and the Directors become the agents of the majority, so far as the Bill under consideration is concerned. It is courting a gratuitous difficulty to pose resignation as the only proper course for Directors whose views respecting a Bill are not approved by the majority. The justification for taking such an extreme course must be a matter of individual conscience; and no general rule can be laid down with regard to such emergencies.

In conclusion, let us repeat that we do not pretend to pass judgment upon the principle of Mr. Livesey's scheme. So much depends, in the carrying out of such a proposal, upon the conditions, so much more depends upon the men, that it would be presumptuous for us to prophesy as to how it would work. It is open for us to observe, however, that we see nothing to be afraid of in the idea; while at the best its possibilities are great.

The Relief of the Gas Consumers of Leicester.

The statement by Mr. Alderman Lennard to the Leicester Town Council, in presenting the accounts of the Gas Department for the past half year, and the discussion that ensued, form some of the most satisfactory reading we have ever come across in regard to the administration and working of a municipal gas undertaking. This observation does not mean that there is anything very extraordinary about the position of the undertaking or the half-yearly accounts relating to it. That it is prospering under the existing management is a matter of course; and that the Chairman and other members of the Town Council honestly mean the department to be worked to the best advantage of the town, is equally to be taken for granted. What gives us such great satisfaction in this debate is the evidence it affords that the Gas Committee are awakening to a sense of duty towards the consumers. The whole of the "profit" for the past year, amounting to £26,897, which is £6878 more than the profit made in the year 1893, is to be handed over in relief of the district rate. This is an enormous subsidy; and even Alderman Lennard has certain twinges of conscience in regard to the appropriation, for he warns the Council not to expect all the profit that the department may make during the current year, if it should turn out to be a good one, as "it would not be fair to the consumers." This is indeed a sign of grace. But there is more—the Committee have abolished meter-rents, which is another slice taken from the ratepayers and given direct to the consumers. One need not despair of Leicester after this. Perhaps when the Committee learn that at Sheffield, where the gas supply has not even been sliding-scaled, to say nothing of municipalized, gas of practically the same quality as the Leicester article can be had for from 6d. to 2d. per 1000 cubic feet less than they charge the private consumer within the borough, they will feel still more plainly the reasonableness of showing the consumer that he too, as well as the ratepayer, has cause to be thankful that the gas-works are controlled by the Corporation. Alderman Lennard's weak point is that of all other gas administrators in his position. He keeps harping upon how much cheaper the gas is than it used to be when the old Company had the works; carefully ignoring the fact that the comparison should be not with what was charged for gas twenty years ago, but what a Leicester Company, if in existence, would be charging now. He boasts of there having been three reductions in price since the Corporation took to the works; and this is something for the consumers to be thankful for. But there are many Companies who have made half-a-dozen reductions during the same period. The most helpful observation upon the vexed question of rates and gas prices was offered by Mr. Edwards, whose name we are glad to signalize, in supporting the motion for the abolition of the meter-rents. He said "he thought it high time the small consumers received "some benefit from the profit made on the gas supply. "However much they reduced the rates, the rent of small "houses was not lowered; but by the proposal now made "these people would obtain some amount of direct benefit." Here lies the hope of the gas consumers of Leicester for deliverance from their burden of tribute. Once let Mr. Edwards's view get familiarized among the cottage voters, and they will take care to return representatives pledged to a policy of cheap gas.

The Progress of Gas Bills in Parliament.

The Gas Bills and Provisional Orders of the current session are being disposed of with commendable despatch. An announcement has been made to the effect that the Chairman of Committees on Unopposed Gas Bills in the House of Commons has decided to fix the minimum of illuminating power at 15 candles in all cases; and the same course will be followed under other conditions. This declaration will save a great deal of unnecessary trouble, and not a little money. The North Middlesex Gas Bill has passed Sir James Kitson's Committee, with alterations amounting to something very like a precedent in several respects. The new capital asked for was reduced from £55,000 to £35,000, mainly upon the representation that this amount would carry the Company on until their present make is doubled. The Company did not apply for the sliding-scale; but this has been inserted in the Bill, with 4s. 3d. per 1000 cubic feet of gas as the initial price, which happens also to be the actual selling price. An agreement has been concluded with respect to the Scarborough Bill, as already announced, with the consequence that it will now go forward as an unopposed measure. The same thing has happened to the Staffordshire Potteries proposals of the British Gaslight Company, who have yielded the point of the Public Auditor demanded by the Corporation—we think, with reason. So long as an Auditor appointed by a Local Authority is restricted to certifying the correctness of the accounts of a gas undertaking, and has nothing to say about the dividend or the management, there cannot be any real objection to such an official, in the interest of the Gas Company. It merely amounts to an endorsement of the familiar declaration that there is nothing to conceal in the books of a statutory gas undertaking. The Ambleside Transfer Bill also has passed the Lords' Committee; the demand of the District Council to escape payment of the customary premium for compulsory purchase having been rejected. The sum to be paid for the undertaking will therefore be ascertained by arbitration, in accordance with the provisions of the Lands Clauses Act. The period for repayment of the money to be borrowed for this purpose, put at 55 years in the Bill, was reduced by the Committee to 45 years.

An Old Question Reopened.

It is a very significant circumstance that at the same time that the Government of the day have submitted to Parliament a Bill for enabling industrial disputes to be settled by arbitration in accordance with a formal procedure that goes as near to compulsion as public opinion permits, an illustration should be furnished, in regard to the Leicester boot-making trade, of the very slight esteem in which the

principle of arbitration is held by the parties to an industrial struggle for serious aims. We are not ordinarily concerned with the affairs of the boot manufacture, as carried on at Leicester or elsewhere; but the present condition of those affairs constitutes a lesson in the objects and methods of Trade Unionism which no employers of labour in any industry can safely neglect to commit to heart. As always happens in these cases, there is some little confusion, created by discrepancies between the statements emanating from different spokesmen, respecting the points of disagreement between the Leicester boot manufacturers—among whom, by the way, is included Mr. Alderman Lennard, the able Chairman of the Corporation Gas Committee—and their workmen. The present dispute is practically, however, over the familiar question of who is to manage the business of the manufacturers—the employers, or the Trade Union to which the bulk of the workmen belong. All minor points of difference are included in this main issue. The employers claim to be entitled to carry on their undertakings according to what their judgment and commercial knowledge show from time to time to be required in order to keep the market and make the business pay. They declare that for a long time past the Union has hampered them in carrying out this principle. They accuse the Union of interfering in innumerable ways, and for the most short-sighted reasons, with the conduct of the factories; and they allege that, while the trade requires the most improved machinery and the least costly systems of production to keep it alive in face of foreign competition, the Union interposes, in the assumed interest of its members, obstruction to the working of the machines to the best advantage, and to other means taken by the employers to keep down the cost of production. These last assertions are hardly disputed by the Union officials, who charge the employers with the design to so employ their machinery as to cut down the men's earnings. It is the old story of employers and men at cross-purposes as to the effect of labour-saving machinery; and probably the dispute will end in the way such industrial conflicts have always gone.

The point we wish more particularly to make in this connection, however, is that there is a degree of tension in industrial relations at which recourse to arbitration or conciliation ceases to commend itself to either party. At Leicester, the common causes of friction between organized labour and the employers were absent. The Union was no mushroom affair, got up by demagogues of an hour for their own benefit, and administered by the hare-brained type of "labour leaders." It was governed according to an elaborate administrative code; it was "recognized" by the employers; and there was besides an arrangement in force by which trade disputes were disposed of. So far as the enforcement of the principles of Trade Unionism were concerned, the Leicester boot trade seems to have been a model industry. Yet what has happened? A war of mutual exhaustion has been declared by both sides over points that lie altogether outside the widest stretch of Trade Union principles—that is, as professed by Trade Union theorists and the newspaper men and politicians who would persuade the public as to the harmlessness of these principles. No single spokesman for Trade Unionism would claim that it is inimical to the free expansion of industry, as required to satisfy the conditions of the market, whether by the introduction of improved machinery or any other means for diminishing the cost of production. Yet in practice the old Adam of the weaving-frame burners is as rampant as ever in the Socialistic Trade Unionist of to-day; and we are witnessing at Leicester the whole resources of a modern Trade Society devoted to resistance of mechanical progress and obstruction to heightened individual endeavour. The Leicester bootmakers are staking their all for the maintenance of the "Union "stroke." How could arbitration, even if arranged for by the State, cast out such an evil spirit as this from the men who are possessed by it? There is only one reliable exorcist for such cases, and his awful name is Starvation. Unhappily, it is not those who commit the blunder of striking against the inevitable who suffer most of the penalty; but let us hope that in Leicester the public spirit of the townspeople will do whatever may be possible to protect the innocent from the punishment due to the foolish. It would be worse than a scandal if the women and children were left to be the real "food for powder" in this deplorable industrial war.

WATER AND SANITARY AFFAIRS.

THE conduct of the Progressives, as a party, has placed the London County Council in what is evidently a false position. The recent elections have upheld the Moderates by a majority of votes, and put them on terms of equality with the Progressives in the Council, except for the presence of the Aldermen. Yet the Council is made to appear, by its three chief appointments of Tuesday last, as altogether Progressive. So also "the will of the "people," as expressed by the votes of the Metropolitan electorate, is practically set at naught; the Progressives thus violating one of their own avowed principles. It is a serious matter when a public body of such prominence and importance as the London County Council is subject to a criticism like that which we find in the leading columns of *The Times*, where it is declared that "neither "the Chairman, nor the Vice-Chairman, nor the Deputy-"Chairman could occupy his present post, if the Council "were constituted in accordance with the results of the "appeal to the people of London." The apparent victory which has thus been gained by the Progressives in the Council may prove even worse than a defeat. Had they come to fair terms with the Moderates, they had been wiser. *The Times* now offers the Moderates the consolation of reflecting that "the intemperate action of the Progres-"sives not only indicates their readiness to flout the con-"stituencies, but throws upon them the responsibility of "carrying out the Council's policy."

We would suggest that, although the County Council, by a narrow and fictitious Progressive majority, has failed to recognize the verdict of the Metropolis with regard to this question of "policy," the Legislature should not be thus oblivious. The policy of the last three years has been discredited, and it ought not to be persevered in. If the Council adheres to it, Parliament may choose to take a broader view, and to consult the verdict of the Metropolis rather than a catch-vote at Spring Gardens. All Progressives may not be alike; and it may prove that on the water question some are disposed to listen to reason and equity, not merely in so many words, but in actual deeds. But what the party is aiming at may be judged by a notice of motion, emanating from the present Vice-Chairman of the Council, which appeared on the *agenda* last Tuesday. It was thus proposed that the Council should declare it desirable for the Transfer Bills relating to the Lambeth and the Southwark and Vauxhall Companies to be pressed forward "with all possible speed." This, of course, agrees with Mr. Charles Harrison's announcement that there was to be no change in the policy of the Council in any respect, and that the Water Bills should not be withdrawn. But it would be well to know a little further what is the mind of the new Council on this subject. All are not Progressives; and all Progressives may not quite agree with Mr. Charles Harrison or Mr. Williams Benn. If a fresh decision is taken on the question of the Water Bills, the subject may be put on a somewhat different footing from that which it occupied last autumn, even though the Companies are now encountering much undeserved odium on account of the phenomenal frost which has affected the supply. On this point, it may not be amiss to notice that the average daily quantity of water supplied by the London Companies during the past month reached the extraordinary amount of more than 220 million gallons, as compared with less than 188 million gallons a year earlier—thus justifying the statement made a short time back by Mr. Bryan, the Engineer of the East London Company, as to the excessive demand for water in times of intense frost. Concerning Mr. Benn's proposition for last Tuesday, we may observe that it stands over until to-day, subject to a notice of an amendment to be moved by Sir John Lubbock, that the Parliamentary Committee should report to the Council as to the probable effect of the purchase of the water undertakings in the manner proposed in the Bills now before Parliament, having regard to the resolution of the Council respecting the necessity for an additional source of supply, and on the basis of repayment in the maximum period of sixty years.

The attitude of the authorities outside the Metropolitan area with respect to the appropriation of the water supply is becoming increasingly decided. All the Local Authorities in the jurisdiction of the Surrey County Council have united in passing a resolution approving the policy of their

Council in opposing the two Transfer Bills which have passed the second reading in the House of Commons. The only transfer acceptable to these Authorities is such as would secure to the Surrey Council the sources of supply necessary for the administrative county, together with all the requisite works. Action of this kind clearly shows that the Surrey authorities would be content with the *régime* of the Companies, rather than have the water supply of their district placed in the hands of the London County Council. The resolution thus adopted was moved by Mr. G. P. Bidder, Q.C.; and the meeting was in all respects of an important character, including representatives from the Kingston and Richmond Corporations, as well as from urban and rural districts, and parish councils. Pointing in the same direction, we have an account of a resolution passed at a special meeting of the Wandsworth District Board of Works. The Wandsworth district is really in the Metropolitan area, and under the London County Council, having its own representative. It is rather singular to find this auxiliary body resolving to oppose the Lambeth and Southwark Transfer Bills of the central authority. Yet such was the determination arrived at; one of the speakers saying they were all agreed that the water supply of the Metropolis should be in the hands of some public body, "but not the County Council."

In these days, when the weapon of legal ingenuity is so frequently allowed, by a non-litigious public, to hang rusting on the wall, it seems harsh to grudge the lawyers the hearing of an argument. Still, "the man in the "street" has but little sympathy with fine-spun contentions, and would be likely to find but little substance in a case which was argued before Justices Lawrance and Kennedy on the 4th inst. The question of law had reference to an arbitration between the Yeadon Water Company and a Contractor's surety; and it came before the Court in the form of a special case. The Contractor had undertaken to carry out certain works for the Company; and one condition of the agreement was the every-day clause providing that, if the contracts were not performed by a specified date, the Company might deduct from the retention money in their hands the sum of £500, and a further sum at the rate of £5 a day for each day that should elapse between the date fixed for the completion and the date of the actual completion of the works. The Company were further empowered, in certain events, to terminate the contract; but without thereby affecting the Contractor's liability, except in regard to the completion of the works by him individually. Pursuant to this power, the Company availed themselves of the above re-entry clause; and the Contractor's surety thereupon took an assignment of the contract, and also entered into a direct agreement with the Company—on the express condition, however, that the terms of the original contract should still stand good; the single exception being that the surety, instead of the principal, was to carry on and complete the works. Yet, in the face of this explicit arrangement, we find the surety contending that the Company, because they had exercised one right—that of re-entry—had forfeited another right—namely, that of taking the liquidated damages out of the retention money. The Judges were against this contention; and they ordered judgment to be entered for the Company. The marvel is that any other decision could have been seriously asked for or expected.

Another case recently decided—in the Liskeard County Court, on the 4th inst.—and raising a question of even wider general interest, from a sanitary point of view, was decided against a Water Company. The Liskeard Water Company under their Special Act are entitled to make a minimum charge of 4s. 4d. per annum for water supply, without including a supply for a water-closet, and to charge 10s. if the supply for a water-closet is included. To meet complaints on the part of the Sanitary Authority, the Company waived their statutory rights, and agreed to accept 2s. 6d. per annum in respect of each water-closet, in addition to the ordinary charge of 4s. 4d. per annum as for a house without a closet. No pipes were laid to the closets, however; and these could only be flushed with water drawn from taps in other parts of the premises. In such circumstances, could it be said that the Company supplied water to the closets for which the half-crown rate might legally be charged? The learned Judge answered the question in the negative. In our view, he was wrong in drawing the inference that water used for flushing the closets had been previously used for washing or some other domestic purpose. It by no means follows that, if the tenants wished to have some regard for the laws of health, they would restrict the water used for flushing to the quantity which had in the first place been drawn from the tap with a different object. If, therefore, the Judge's decision proceeded on that assumption, it would appear to be erroneous. But that was not the main point, and on the general issue there is certainly much to be said for the view that any reasonable theory of supply to a water-closet implies something more—viz., pipes, cistern, and so forth—than the right to use water brought from some other part of the premises for flushing purposes. At any rate, it is unfortunate in these days that a Water Company should be driven to support the contention which the County Court Judge has here disallowed.

The Resignation of Mr. Hepworth.—At the meeting of the Carlisle Town Council last Tuesday, a letter was read from Mr. Hepworth, declining the appointment of Consulting Engineer to the Gas and Water Departments, at a salary, as offered to him in a letter enclosing a copy of the Council's resolution on the 12th ult. (see *ante*, p. 365), but expressing his willingness to render any assistance in his power should the Corporation at any time require his services in connection with the works as a whole, or any of the important matters connected therewith or at present in progress.

The Management of the Leeds Corporation Gas Undertaking.—Last Tuesday, the Gas Committee of the Leeds Corporation resolved to recommend the Council to appoint Mr. R. H. Townsley (who for the past six and a half years has occupied the position of Manager of the York Street Gas-Works) as Chief Clerk and Superintendent of the Gas Department, in succession to the late Mr. James Lupton. There were upwards of 90 applicants for the post; and at a previous meeting, the Committee reduced this number to four. Mr. Townsley is 34 years of age, and became a pupil of Mr. Henry Woodall in 1878. Subsequently he was Mr. Woodall's chief assistant, and later was made Chief Chemist in the Corporation Gas Department.

Gas Power Propulsion for Barges.—Writing to the *Engineer* on the subject of the gas-engine propelled barge to which reference was made in a "Note" in the JOURNAL for the 5th inst., Mr. B. H. Thwaite states that his friend Mr. Dugald Clerk asked him, some three or four years ago, whether it would be possible to drive a gas-engine on board ship with gas directly made from coal, and in plant placed in the vessel. Mr. Thwaite replied that he did not see any insuperable difficulty. He goes on to say: "Although the *L'Idee* only carries out part of this gas-ship scheme, nevertheless what has been done by our French *confrères* is encouraging for the near future development of the complete scheme, that will be as self-contained as the present steam-driven plant; but the margin of fuel-saving in substituting gas plant for steam plant applied to very large ocean liners or traders is not very great, thanks to the care of design given by marine engineers to this application of Watt's masterpiece."

Madame Alting-Mees, whose attractive method of demonstrating the value of gaseous fuel in domestic operations has done so much to extend its use both in England and on the Continent, has lately been giving the Portuguese ladies some valuable instruction in the culinary art. In the fortnight ending the 9th inst., she delivered, for the Lisbon Gas Company, a series of lectures in the Company's Board-room, capable of holding 200 people. But so keen was the desire to attend, that it proved much too small; a sufficient number to more than fill the place having to be sent away nightly. It was therefore decided to engage a larger hall; and in this a fresh course was commenced on Monday last week. The demonstrations have been appreciatively noticed by the local papers, and good business has been done. It was not as the advocate of any special make of stove that Madame Alting-Mees appeared before her audience, but as a general exponent of the advantages of gas—a fact which may be left to the favourable consideration of those companies who undertake their own exhibitions.

Mr. H. Ashton Hill, Assoc.M.Inst.C.E., the Engineer and Manager of the Wallasey Gas and Water Works, has been selected, out of 70 candidates, to fill the position of Chief Engineer of the South Staffordshire Water Company, vacant by the death of Mr. W. Vawdrey, as already mentioned in the JOURNAL. Mr. Hill has been about thirteen years at Wallasey; and during this period, as our readers are aware, he has carried out important extensions in both the gas and the water works. These, and his general management of the undertaking, have, from time to time, been the subject of encomiums by his professional brethren. It will be remembered that Mr. Hill read an instructive paper at the last meeting of The Gas Institute, giving the results of his working at Wallasey, with special reference to the use of cannel for enrichment; and it is therefore regrettable that he will not now be able to send further contributions on this branch of his profession, as, in his new position, he will, of course, devote himself specially to water engineering. The Company into whose service he enters is an important one; their operations covering a large area, extending a distance of something like forty miles. Mr. Hill will consequently find wide scope for the exercise of his abilities.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 611.)

Business on the Stock Exchange last week was quiet on the whole; and movements in price were variable and of no great magnitude. The great speculative mining camp is, of course, outside all rule, and has a history of its own. First-class securities did not improve; but, *per contra*, some of the very much depressed had a ray of brightness. The settlement was an important item; and it appears to have worked out smoothly. It also caused some demand for money, and effected an agreeable improvement in the rates for short loans. The main position of the market, however, indicates continued ease in the immediate future. In the Gas Market, business has been fairly active; the two big issues having the lion's share. Changes in quotation are very few. But all that there are point upward; and the general characteristic is firmness. In Gaslights, the "A" opened no better than it had closed the Saturday before; and next day it fell away a point. It rallied, however; and the buying price was put up a couple on Thursday. The improvement was sustained; and the closing mark was the best of the week. The debenture, preference, and limited issues were well supported, and commanded good figures, though they did not improve upon them. There was a fair amount of business in South Metropolitans, at prices which were well up to the mark. The quotations, however, which have steadily risen week by week, did not vary. Commercials were untouched and unchanged; and stock is so scarce that the market cannot move. The Suburban and Provincial Companies also are very slack for want of business; and if stock only came into the market, they would rise freely. Tottenham and Edmonton is not often obtainable; so the Directors had no difficulty in disposing of £20,000 new stock (paying 8½ per cent. dividend) at the Mart on Tuesday. at an average price of 177½. Of the Continental Companies, Imperial was the most active. It was inclined to fluctuate at first, but took a better turn; and the buying price was put up two points. Union and European were firm and quiet. Among the rest, the only change was a slight advance in Ottoman. The Water Companies suffered a reaction from their advances of the previous week, and most quotations were put down; but little business was done.

The daily operations were: Business in Gas was not very brisk on the opening day, nor were prices remarkable in any way. The only variation was a rise of 3 in Crystal Palace. There was more business on Tuesday, especially in Gaslight "A" and Imperial Continental, neither of which stood very firm, and the former fell 1. In Water, Grand Junction was 1 lower. On Wednesday, there was a great falling off in business; it being the quietest day of the week. Gas quotations were unchanged; but in Water, Lambeth 10 per cent. fell 3; and Chelsea and Grand Junction, 1 each. Activity in Gas was renewed on Thursday; and the tone improved with a rise in Gaslight "A" and Imperial Continental of 1 each. Water continued flat; and East London receded 2. Firmness in Gas was sustained on Friday, at the old quotations. In Water, New River and West Middlesex fell 2 each; and Grand Junction, ½. Gas closed firm on Saturday, without change, except a rise of ¼ in Ottoman. In Water, there was a further fall of 2 in Lambeth 10 per cent.

ELECTRIC LIGHTING MEMORANDA.

The St. James's Nuisance Litigation—Mr. W. H. Preece and the Hampstead Vestry—The Trouble with Electrical Conduits—Electrical Heating for Theatres.

The so-called "nuisance" litigation over the proceedings of the Metropolitan low-tension electric supply companies has entered upon another stage, in the instance of the *Attorney-General v. the St. James's and Pall Mall Company*, which is an action by the Attorney-General, at the relation of the Vestry of St. James, Westminster, for an injunction to restrain an alleged public nuisance by vibration, noise, emission of gas, smoke, effluvia, steam, and hot water, caused by the Mason's Yard central station of the defendants. The first line of defence raised on behalf of the Company was that they are absolved from risk of prosecutions of this kind by the terms contained in their Provisional Order, which they are bound to carry out in a proper manner. It had to be conceded, however, in consequence of a previous decision of the Court, which was upheld by the Court of Appeal, and which it is believed will be taken to the House of Lords, that this defence could not avail. The issue therefore turned upon the question of fact, as to whether or not the acts of the defendants constituted a nuisance. Both sides were prepared to go into the matter—the plaintiff's case being supported by a "cloud" of forty witnesses; but as soon as it was opened an arrangement was come to by the parties for a reference to an engineer. An order by consent was then made to give effect to the findings of the referee, whatever these may be; the defendants paying the costs of the action and the expenses of the referee—the costs of his inquiry to be at his discretion. This is a very pretty way to run up the price of the unit of electricity in a town district; and the Metropolitan low-tension companies may well tremble at the prospect that lies before them. The idea is perhaps impracticable; but it does seem a pity that questions of this nature cannot be gone into before things arrive at a pitch when an adverse judgment means so very much to the convicted offenders.

Some pungent remarks were made at the Hampstead Vestry meeting, reported in another column, respecting the conduct of the eminent gentlemen who undertake to engineer electric lighting installations for public authorities. The Vestry have a venture of this kind, installed under the advice of Mr. W. H. Preece; and the meeting in question was called for the purpose of considering a recommendation of the Lighting Committee to retire Mr. Preece to the dignified and harmless position of Consulting Engineer. The Hampstead Ratepayers' Association had moved in the matter, in opposition to the retention of Mr. Preece's services; and the subject was discussed very acrimoniously and at greater length than we can report. Mr. Hall, a vestryman, asserted that Mr. Preece's reports for the Vestry had been prepared by his subordinates; and he protested against the Hampstead installation being made "the hunting-ground of Mr. Preece's sons and other people"—whatever this may mean. Several other vestrymen spoke their minds very freely as to the manner in which the electric lighting work of the Vestry was done; and, in short, the whole discussion resolved itself into a very public "washing of dirty linen." Probably one of the truest remarks made on the occasion was that "the ratepayers would shudder when they found out what this electric lighting had cost." Well that is their affair. If local authorities will spend ratepayer's money upon luxuries, by the advice of fashionable engineers who cannot be blamed for making their hay while the sun shines, there is no help for it. The day of awakening comes soon or late; but these "morning's reflections" do not disturb the ingenious gentlemen who have the knack of turning to their own advantage the "evening's amusement" of electric lighting committees of vestries and corporations.

The discovery that electrical street conduits are capable in some circumstances of acting as factories for the preparation of dangerous chemicals has naturally spread consternation among those electricians who have constructed and are responsible for the safe working of conduits in which the necessary conditions of this objectionable manufacture exist. It is now declared that all salt-glazed insulators for electric supply purposes must be condemned; the evidence of their suitability for telegraphic work, upon which the electric lighting engineers relied in selecting them, having proved misleading. But there must be hundreds of miles of such conduits laid in different places throughout the country, at an enormous capital outlay; and if all this work has to be done over again, the consequences to many struggling undertakings will be calamitous. Meanwhile, the partisans of bitumen conduits and glass insulators are in the happy frame of mind which is caused by observation of one's neighbour's troubles. Major-General Webber took an opportunity, at the recent meeting of the Chelsea Company, to assure the proprietors that they have no reason to fear for their distributing plant; and he also took occasion to speak a good word for the Gas Company, with whom he declared his Board to be on "excellent terms." This testimonial will not tend to soothe the feelings of the St. Pancras people, who have tried to make out that the same Gas Company are the prime cause of all their distribution troubles. It is a curious medley.

It is interesting to learn that a practicable method of applying electricity to the purpose of heating interiors has been worked out by Messrs. Crompton and Co., and is in actual operation at the Vaudeville Theatre, in London. This firm have been so energetic and determined to achieve success in this direction, if it were possible, that it is a real pleasure to chronicle the fact of their having, to all appearance, secured a triumph in a difficult and most doubtful enterprise. It is also gratifying to hear that the late severe weather has been good for somebody. The weather in this country is rarely so cold as to render it necessary to artificially heat theatres, which get only too hot, as a rule, before the curtain has been long up. It is known, however, that the London theatres have been suffering from a "frost," in more than one sense of the word, of unexampled severity; and the authorities at the Vaudeville decided to do something to make their house cosy in spite of the Arctic weather without. Accordingly, a number of electric heat-radiators were tried, in connection with the lighting service; and the result was so satisfactory that a complete set of these appliances has been fixed where most needed. The radiators are resistance boxes, and attain the ordinary temperature of hot-water pipes, for which they are declared to be a handy substitute. The electric lighting company charge 4d. per unit for the electricity thus utilized, although it is not a "day load" supply, and at this price it costs 12s. to warm the theatre for a performance. The first cost of the apparatus is about the same as for hot-water plant.

Alderman E. Baddeley, a member of the Gas Committee of the Stoke-upon-Trent Corporation, died last Wednesday, in his 75th year.

Mr. A. W. Elliott, assistant to Mr. R. O. Paterson, Engineer and Manager of the Cheltenham Gas Company, has been appointed Superintendent at the Shrewsbury Gas-Works, under Mr. W. Belton, the Company's Engineer and Secretary.

THE DISTRIBUTION OF GAS.

LAST week we treated of a subject that might be fairly regarded as suitable for discussion at the approaching meetings of the National Associations of Gas Engineers and Managers, though it is not a technical matter. We now propose to pursue the question of the subject-matter to which the attention of the associated and incorporated representatives of the gas industry may profitably be directed in the coming summer, and to carry it into the field of technics, where also moving and topical problems are to be found for the looking. Of all the actualities of gas engineering that appeal at the present time to the consideration of the public as well as of members of the profession, there is none more pressing than the whole subject of gas distribution. Recent occurrences in London streets and in other large towns have raised the old bogey of gas leakage from mains and services in a particularly grisly shape. In London and elsewhere, he has appeared with bangs and alarms calculated to seriously upset the minds of wayfarers and frontagers; and in Glasgow he has been more insidious, and also, unfortunately, more deadly. It would be a lapse from duty on the part of the associated representatives of the whole gas industry of these kingdoms if they were to lose the opportunities shortly to be presented for putting upon record something like an authoritative case for established practices in gas distribution, whereby other orders of technicians interested in the general subject of utilizing the subsoil of town thoroughfares for similar purposes, as well as local authorities and the public, may learn what the much-vilified gas interest has to say for itself in this respect.

It might be thought off-hand that gas mains and services and unaccounted-for gas had been debated often and thoroughly at gas managers' meetings; but such is far from being the case. In the "Subject-Matter Index" issued by the Publication Committee of The Incorporated Gas Institute, and forming an Appendix to the published volume of "Transactions" of this body for 1894, all references to the question are given under the heading "Mains and Services," with one exception. There are not many; but then it is true that the index is far from perfect. The first reference is to a paper on "Leakage from Gas Mains and Services," by Mr. E. S. Cathels, read at the 1867 meeting of the British Association of Gas Managers. This is decidedly ancient history. The paper itself was mostly concerned with certain specialties proposed by the author, of which it is only necessary to remark that they failed to commend themselves to other practitioners of the profession. The paper was followed by a discussion, in which the particular subjects introduced by the author were, by common consent, ignored; all the speakers preferring to talk at large about their own experiences in main and service laying. How primitive were the ideas then held by leading technicians respecting the proper way of installing and taking care of distributing plant, may be gathered from several remarks duly recorded. But, notwithstanding this, the observations made on the occasion by the President (the late Mr. Thomas Hawksley) and others, testified to the interest that was being taken in the subject, and the solicitude of the most advanced engineers to arrive at a proper understanding of it in every aspect. The discussion is well worth reading again in the light of modern results. In 1873, the subject was again introduced to the Association, by Mr. W. B. Emmerson, and Mr. W. J. Warner; and there was then another general discussion. Mains and services were once more dealt with by Mr. Warner in 1876; and the same author published in the following year a supplementary paper on a branch of the subject to which he had devoted particular attention. The 1876 paper was a most valuable and instructive one; the author passing in review all that had been suggested and done before this period for the prevention of leakage from mains and services. The discussion was very brief. Mr. C. W. Folkard read a paper in 1883 upon the "Jointing and Testing of Gas-Mains;" and several descriptions of methods and devices for testing for leaks, &c., have been given and discussed at meetings of District Associations of Gas Managers.

All these references are more or less ancient. They relate to an era and a practice which had no such experiences as those that have once more brought into question the whole subject of gas distribution. The work of gas managers in grappling all these years with the difficulty of unaccounted-for gas has nowhere been described and illustrated. It has been work of a patient, continuous, careful kind; and such improvement as has been realized by the engineers who have the best records in this respect is not due to the adoption of any new principle or notable specialty, but to the co-operation of a number of small precautionary measures. We want to have a statement from one or more of these painstaking gentlemen upon this head, for the justification of the gas industry in face of the charges of carelessness and disregard of their own and the public interests which have been levelled against it consequent on occurrences within the memory of all. We want some capable worker, who can speak at first hand on the whole subject, to take it up at the point where Mr. Warner left it nineteen years ago, and show what has been the fruit of these careful years. Surely there is something to be advanced on this side of the question, to show what is regarded as the correct way to bring down unaccounted-for gas to the irreducible minimum, where it becomes a matter of mere statistics.

There is no necessity to argue afresh the question of what is meant by "unaccounted-for gas." As we have often remarked, with abundant reason, in the eyes of the public this term means leakage, nothing more nor less. Of course, to the gas engineer, it means very much more than leakage, and especially more than that proportion of leakage with which the public are likely to be brought into contact. To the gas manager, the sum of all differences, of whatever kind and howsoever arising, between the registration of the station meter and the indications of the consumers' meters is the unaccounted-for gas. The public care for nothing besides what escapes from the mains and services. The crucial question is, therefore, what proportion this last quantity bears to the whole. The usual method of stating the proportion of unaccounted-for gas as a percentage of the output does not help to show how much is waste, as Mr. Hawksley pointed out a long time ago; and it is the actual waste that everbody wants to get hold of.

Since the subject was discussed generally by an assembly of gas engineers, many things have happened. The pressure of gas maintained throughout the distributing network has increased at least twofold, taking one district with another, owing to the obligation to keep gas stoves and engines going. This change of conditions has compelled gas managers to reconsider their attitude towards their distributing plant. Whereas their chief care formerly was to humour the plant wherever possible by keeping down the gas pressure, and consequently diminishing the tendency to leakage, now it is all the other way, and the pressure is put up first and the leaks looked for afterwards. There are towns in the United Kingdom in which not one-half the gas is now lost, although the pressure is double what was customary twenty years ago. Then the character of the street surfaces has been wholly changed of late years; in many places impervious pavements being substituted for the porous macadam of former days. People are now asking themselves whether this alteration demands a corresponding adjustment of gas-distributing plant; but meanwhile the question does not appear in contemporary technical literature. One relief, at any rate, the close pavements have brought with them—they are not laid by the assistance of the steam roller. And last, but not least of all, arises the consideration of what must be done to meet the novel conditions presented by electric lighting culverts and subterranean chambers. It thus becomes a work of supererogation to prove, by citation of further new conditions, that the period is ripe for a review of the methods of gas distribution.

Such a claim does not mean that these methods are defective. Far from it. An incisive paper upon the whole subject may go to show that gas distribution is "more sinned against than sinning;" but it will be just as well to make this clear. On the other hand, if it can be shown that one gas engineer gets better results in this regard than others, it will be no hardship to the inferior practitioners to learn how to improve their ways. We have all been abusing the water distribution systems of the country during the past severe season; and the electricians and some of the public have been disposed, on totally different grounds, to heap discredit upon the gas-pipes which occupy the same roads. Let us see what can be done to meet the demands of the hour—freely conceding the right of the public to be supplied according to the best known methods, while declining to accept responsibility for performing the impossible.

Gas engineers must not make too much of the tempting point that, whereas they have been occupying themselves for a generation past, unsuspected of the public, in reducing the proportion of unaccounted-for gas from 20 per cent. or more to a modest 3 or 4 per cent., the popular protest has only arisen after the worst of the evil has been cured. This is always the case in social movements. The moment an evil has begun to yield to treatment, it is declared to be a scandal to the community. The true point consists in the fact that a loss of 4 per cent. of gas, if demonstrably waste, is a greater blot upon the gas engineering of to-day than a much higher figure in the same category would have been a few years ago.

The gas distribution paper we ask for is not one for the glorification of any proprietary system, or for the recommendation of a particular appliance. Twenty years ago, all sorts of devices were in vogue, or at least were possible, for the satisfactory distribution of gas. But these "tricks" have been abandoned, and practice has fined down to a fairly compact consensus of opinion as to what is and what is not necessary in this regard. Let this working rule and its results be put upon record by some engineer who thoroughly understands and acts up to it; and the publication can hardly be other than beneficial to the interests of the industry.

Cheap Ammonia.—We learn from "*Metall- und Eisenzeitung*" that a Baltimore inventor claims to have solved the problem of the cheap production of ammonia from the nitrogen of the atmosphere. Particulars of the method are not given; but apparently gas suitable for lighting, heating, and motor purposes is formed as a bye-product. A glowing account of the vast benefits that cheap ammonia and cheap gas would confer on the world is given; but no means are afforded us of judging the fitness of the process by which the inventor hopes to secure these blessings for the community. The *Gastechniker* after recapitulating the visionary revolution of the industries of the world that the invention expects to effect, cogently remarks, "it remains to be seen if these fair dreams are to be realized."

NOTES.

The Cost of Power at the Niagara Falls.

An interesting article by Mr. Ed. C. de Segundo in a recent number of the *Engineer* describes, from personal inspection, the condition and prospects of the Niagara power utilization scheme. The article is a highly appreciative one; and the author of it evidently thinks that the Cataract Construction Company will achieve great things. Mr. de Segundo's observations are of special interest as indirectly bearing on the problem of the commercial production of carbide of calcium and other products of the electrical furnace. It has been remarked by way of criticism upon the proposals of the Niagara Company, that it has never been made clear how much the power is going to cost, and what it will be sold at. Mr. de Segundo does not supply the want as fully or as authoritatively as could be desired; and he admits that the Company are somewhat reticent on the subject of the cost of the 120,000-horse power with which they propose to begin business. He says, however, that he has reason to conclude that at the Niagara Falls electrical horse power will be obtainable at the rate of £6 to £8 per horse power per annum, or about ¼d. per 1000 watt-hours. What the cost will be at Buffalo, or at a distance of about 320 miles, is as yet problematic. It is observed that the Pittsburg Aluminium Reduction Company, who have a contract for power with the Cataract Company, find it advantageous to move their works from the present position, although good coal is to be had there at 3s. 4d. per ton. Mr. de Segundo finally remarks that he has no doubt that at Niagara Falls it would hardly pay to use steam power in place of Niagara power, even if the State gave the coal for nothing.

Sedimentary Deposits in Gas-Engine Cylinder Jackets.

A curious cause of trouble with gas-engines is reported from Munich by Herr Trillich; and the example is worthy of being noted for the guidance of gas-engine users. It arose in connection with two gas-engines, of 50 and 25 horse power respectively, which had been at work for about a year, when it was discovered that they became very much overheated in different places, notably about the exhaust-valves. The circulation of water through the cylinder jackets was much impeded; and there were often premature explosions of the charge. On taking the engines to pieces, it was found that in parts the circulating water-pipes, and even the jackets themselves, were almost completely choked up with the well-known scale similar to that formed in steam-boilers or feed-water heaters when using water heavily charged with lime salts. The question arose as to how this deposit came about, seeing that the circulating water used in connection with the gas-engines never attained the temperature at which it would throw down salts held in solution. It was concluded that the action must have taken place during the short period immediately after the engines stopped working. During these daily recurring periods, the circulating water stopped also; and consequently the water remaining in the cylinder jackets became sufficiently heated by the adjoining parts of the engines to throw down the dissolved salts. Consequently, Herr Trillich lays emphasis upon the necessity of keeping up the flow of water through gas-engine cylinders after the engines have stopped, for at least a period of time sufficient to cool down all parts of the cylinder. And if soft water can be obtained for this purpose, so much the better.

A Phenomenon of Welding and Regelation.

With reference to the welding property of iron, Mr. T. Wrightson has communicated to the Royal Society some observations he has made of the results of recent experiments, which he interprets as indicating that the phenomenon of welding in iron is identical with that of regelation in ice. In 1879, the author proved by experiments upon cast iron that this form of iron possesses the property of expanding while passing from the liquid to the plastic state during a small range of temperature, and then contracts on assuming the solid state; and it was found that this expansion amounts to about 6 per cent. by volume. This property of iron resembles the similar property of water in freezing, which, within a range of about 4° C., expands about 9 per cent. of its liquid volume, and then contracts as the cooling proceeds. Many householders had lately an unpleasant reminder of this property of water. Professor James Thomson and Lord Kelvin have discovered that a body which exhibits the anomalous property of expanding when cooled and contracting when heated is also cooled, instead of heated, by pressure or impact. By the aid of Professor Roberts-Austen's recording pyrometer, Mr. Wrightson has now ascertained that when wrought-iron bars are heated to the welding temperature, and the weld effected by mechanical pressure, a molecular lowering of temperature takes place immediately upon the application of the welding pressure. The fall of temperature has been observed to range from 57° to 19° C., according to the circumstances of temperature and pressure.

Communications Respecting Argon.

Although doubts have been cast, for a variety of reasons, upon the reality of the discovery by Lord Rayleigh and Professor Ramsay of a new constituent of the atmosphere, named by them "Argon," corroborative testimony to the fact is coming in from various quarters. Mr. H. F. Newall has sent to the Royal Society a note on the "Spectrum of Argon," which describes how the author observed, in the course of a spectroscopic investigation in which he has for some time been engaged, the appearance of a line spectrum, which, so far as he was able to make out, was unknown, in some of his photographs. It appeared in May and June, 1894, under conditions which led him to call it, for the sake of convenience, "the low-pressure spectrum." It now appears that the lines are those of argon; the material having been obtained from air, from which nitrogen was eliminated by passing an electric discharge through it in presence of hydrogen or moisture and acid. Mr. Newall's results are found to agree well with those obtained by Mr. Crookes with recognized argon. Mr. Newall has repeated the experiments, with slight variations, several times, with constant results so far as the spectrum of argon is concerned. He remarks that it is interesting to find argon asserting itself, unsolicited, in quite new circumstances, and under conditions which practically constitute one more mode of separating argon from nitrogen. Dr. B. Brauner sends to the *Chemical News* a communication on the preparation, or rather the separation, of argon on a large scale, in which is recalled the Mallet method of obtaining oxygen from the atmosphere, by utilizing the preference of water for absorbing oxygen as compared with the accompanying nitrogen. By means of an apparatus described in 1870, in which air was pumped into water under great pressure, the absorbed gases being then liberated, and again pumped into water, it was found possible, after eight repetitions, to obtain a gas composed of 97·3 per cent. of oxygen, and 2·7 parts of nitrogen. Dr. Brauner says he has no doubt that the latter is nearly pure, or at any rate highly accumulated argon, and that this method will prove effective for the production of crude argon, especially if the oxygen is first removed, in the technical sense, by passing the air over red-hot iron filings.

COMMUNICATED ARTICLE.

GASEOUS FUEL IN THE RETORT-HOUSE.

By T. S. Cleminshaw, Assoc.M.Inst.C.E., of Launceston, Tasmania.

In a paper presented at the last meeting of the Incorporated Gas Institute, this setting was described at some length; but, owing to the absence of a diagram, it was naturally somewhat hard to understand the style of setting employed. Probably a more precise description of the arrangement will now be of interest, in so far as the setting and the foundations are concerned. The recounting of the facts will also be of assistance to others placed in a like position; and if such is the case, the object of the present communication is fulfilled.

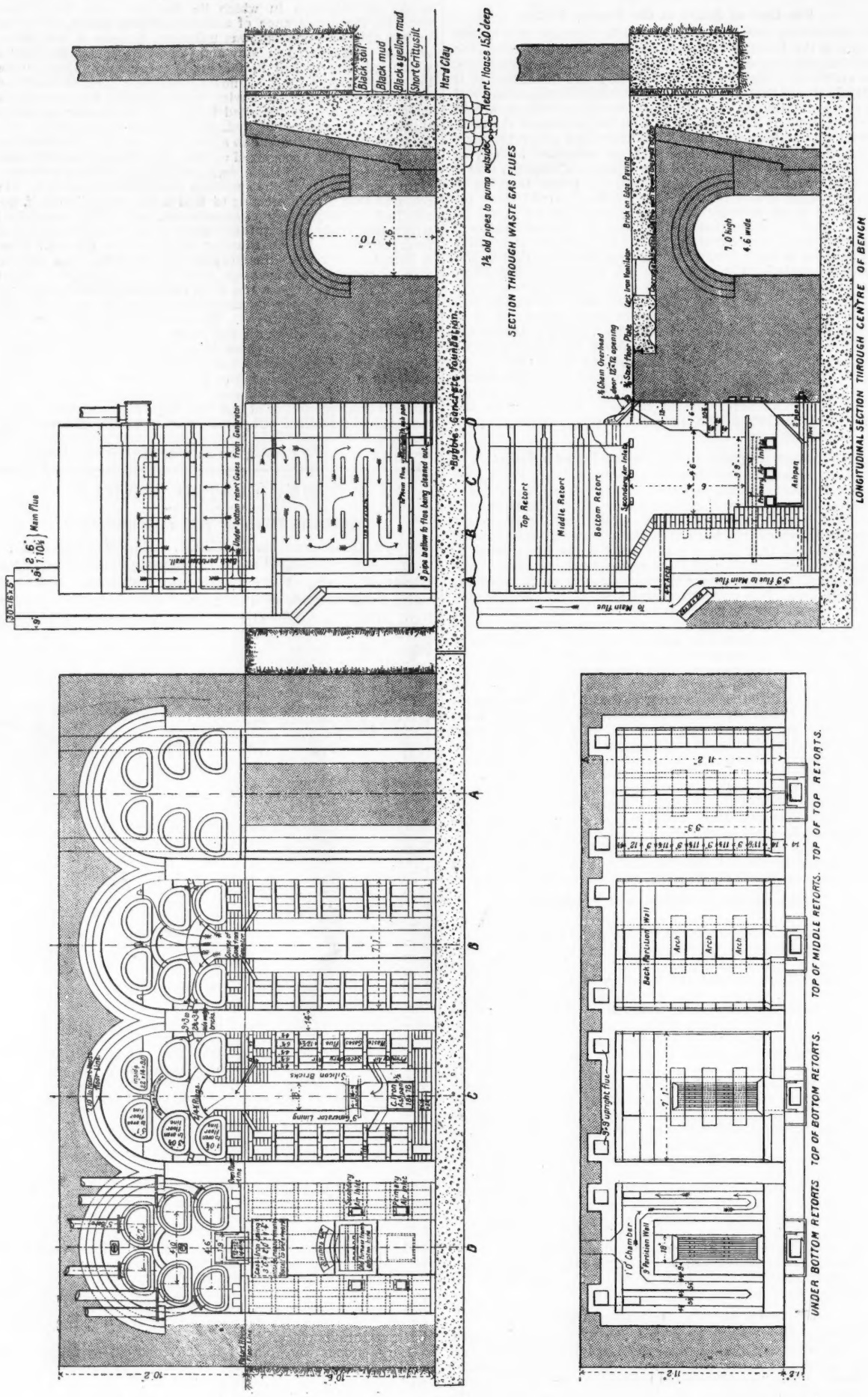
It would be wearisome to describe the various steps that led to the production of the accompanying style of generator furnace as well as the setting. From the drawing, it will be seen that the arches of the settings are carried down to a depth of 10 ft. 6 in. below the floor of the retort-house. This depth was arrived at after mature study and experience; for the arches being narrow—7 ft. 1 in.—did not permit of a wide furnace with the secondary air-flues arranged as they appear. Nor would it have been feasible to repair the same, because the retorts above would have been endangered by removing their support.

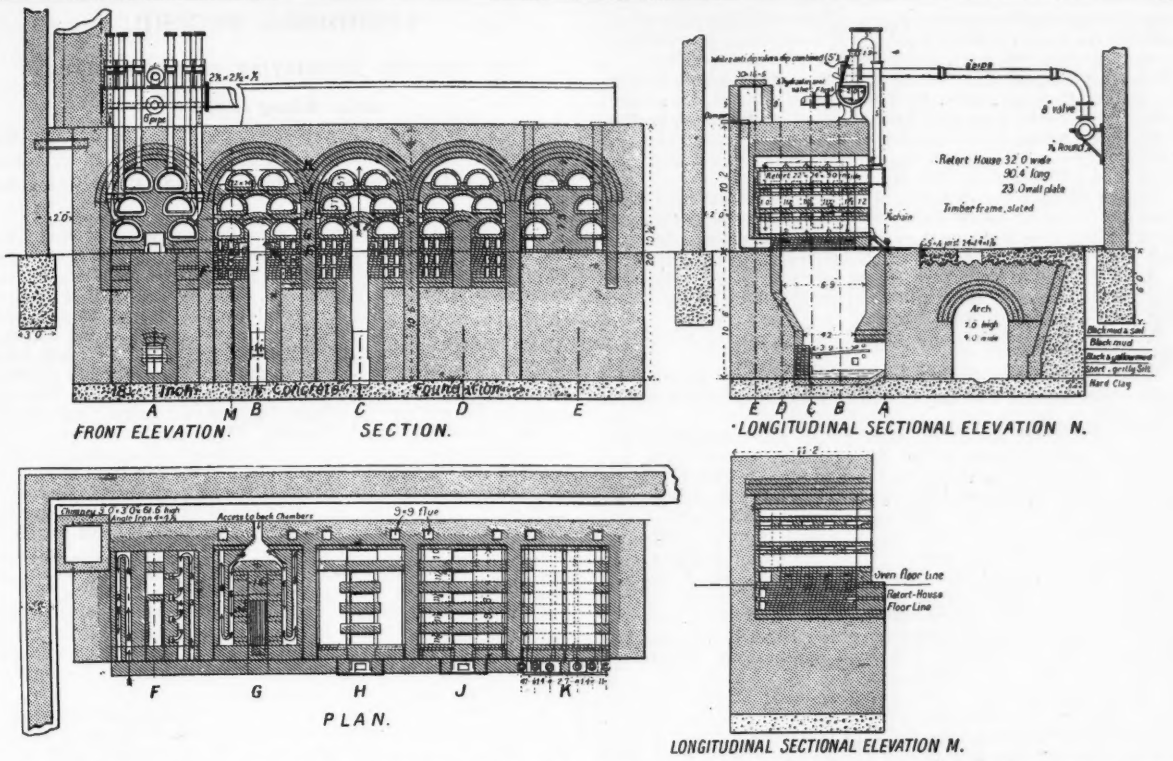
The first part of the work was to dig a sump 3 feet by 3 feet by 16 feet deep, in brick in cement, and allow for a permanent system of drainage under the walls of the retort-house as well as the heavy retaining walls shown on the plan. This sump remains for use in keeping the foundations dry; and three or four times per day of 24 hours, a 2-inch pump, worked about ten minutes each time, keeps the water down. Pipes are laid under the retaining and the 14-inch cross walls; and the same plan is pursued with any extensions.

It will be seen, on reference to the drawings, pp. 588-89, that the old ground-level was 6 feet below the present retort-house, and 3 feet below high water in a tidal river 100 yards or so away. The ground demanded the greatest care in its excavation; being exceedingly treacherous. The timbering used for the main walls was 8 inch by 2 inch gum; the walings, at 4 feet spaces, being 9 inch by 3 inch; and the struts placed 5 ft. 6 in. centres and double at the ends of the walings. Four sets of these were used in sinking the walls. The heavy wall between the retort-house and the coal-store, 23 feet high to the wall-plate, was of anything but first-class work; and a large quantity of coal stacked 12 feet high in the store was an increased source of danger. The rubble foundation was used as a backing to place the runner against; and when the last set of walings was placed in the trench, at the level of the top of the concrete (the runners being driven well into the clay below the concrete), the mixing of concrete was proceeded with, and tightly packed in to secure the timber. The timbers at the back of the retaining-wall were not removed.

The concrete was composed of the following ingredients, to 3-inch gauge: Broken bricks, fire-bricks, retorts, 18 parts; clean sharp quartz sand, 7 parts; and Portland cement, 2 parts. It was turned over twice dry; twice wet; and then tipped out of barrows into its place.

Large stones were placed in the concrete—3 inches intervening horizontally and vertically—and well rammed in; and when the first 1 ft. 6 in. was reached, the brick wall was built. At each 2 feet of its height, the back was filled in, and large


SECTION THROUGH WASTE GAS FLUES
LONGITUDINAL SECTION THROUGH CENTRE OF BENCH
UNDER BOTTOM RETORTS TOP OF BOTTOM RETORTS. TOP OF MIDDLE RETORTS. TOP OF TOP RETORTS.
Hard Clay
Black Soil
Black mud
Black & yellow mud
Short Grit & silt
Top Retort
Middle Retort
Bottom Retort
Ashpan
Main Flue
Brick on Edge Paving
Steel Floor Plate
Secondary Air Inlets
Primary Air Inlets
Arch
Partition Wall
Chamber
Generator Lining
Slicon Bricks



stones were left projecting, to ensure a bond for the next lot of concrete. Pockets, 2 ft. 3 in. wide, were left in the brick-facing, to allow of the buttresses; and the 14-inch cross walls were continued afterwards. Care was taken that the brickwork was not bulged outwards; temporary boards being used against the bricks as the work proceeded.

After the main wall was built high enough to receive the corrugated flooring, and racked off for extension, the cross walls were commenced, and carried underneath the division walls of the benches, about 18 inches, to secure the fronts; and the intervening parts were excavated, and the concrete floor put in as shown. It was provided with a tramway, for the removal of the ashes, and a gutter in the centre to conduct the water overflowing from the furnaces or in washing down the floor, &c. This surplus water is led to a small sump, and then lifted by a steam-ejector.

A 14-inch wall was built under the ordinary front wall of the benches from the floor to the level of the flues in which the secondary air is heated; and a suitable opening was left in the centre to receive the gases from the outside generator.

At first, outside generators were employed. But the frightful heat of the cellar indicated a waste of fuel; so that, when the opportunity offered, the furnace was put inside the setting. The result was much less heat in the cellar, and economy of fuel in the furnace.

At first, the furnace was fitted up as a dry hearth; but the clinker and dust proved so troublesome, that a change has been made to one with a wet hearth, with successful results, as the absence of clinker shows. Both water and steam are used; the water being led on the fuel under the arch, so as to damp the fuel, and save the intense local heating that ensues in its absence. The steam is led below the bars; and the overflow of water is led away alongside the wall to the drain.

The sides of the generator are contracted, as shown, in order to prevent the primary air "short-circuiting" up the walls of the generator, and thereby fluxing clinker and brickwork.

The generator calls for slight mention, as it is open at the floor of the oven, 18 inches wide and 6 ft. 9 in. long. The top part for six or eight courses is lined with silicon bricks, and the remainder with Glenboig. A schedule of quantity of these bricks is appended, showing the approximate number required for the generator lining. The generator forms a work by itself. It is "straight jointed" to facilitate repairs. The flues for the secondary air are covered with plain tiles—not rebated; and when the bench was let down for repairs, after a run of 800 days' total life, the work was quite sound. The generator and flues are washed well with Purimachos cement previous to firing

The style of setting is somewhat peculiar; and a description of it, with a reference to the drawing, will no doubt facilitate matters.

The oven being levelled up to the oven floor-line, the side (4½-inch) walls are run up their full height five courses of two-and-a-half bricks level all through; also the midfeather wall, which stops 9 inches from the front wall. Then the back 4½-inch wall at the end of the retorts has a 4½-inch arch turned over the entrance of the back chamber (which entrance is for cleaning out the chamber). The 24 inch by 15 inch by 2½ inch tile on each side covers the space across the three 4½-inch walls, and serves to protect the retorts at this part from falling into the flue. The 4½-inch wall adjoining the furnace wall is now carried up five courses at each end, but the centre part only two courses; loose bricks being placed to enable the flat plates used in running in the retorts to be sustained.

The retort is now run in, and the joint made on the side of the oven and midfeather walls; the vacancy in the furnace wall being made use of for pointing up the bed on the midfeather wall, so as to avoid short-circuiting of the waste gases from inner to outer flues under the bottom retort. The 1½-inch space along the side of the oven and retort is now filled in (to the height shown) with broken bricks and fire-clay; and the end of the retort is served in like fashion if needed. The end and partition walls are next carried up to a height of 3½ inches above the bottom retorts. The furnace arches are now turned over; and saddles are placed and bedded *in situ*, and wedged at the side of the arch. The middle retorts are next run in, and bedded and wedged as shown; the upper furnace arches being turned and levelled off to receive the two top retorts. On these being placed, they are secured at the back end by the 4½-inch wall carried up so as to be level with the top of the retorts. The stays at the side of the retorts and between them (not shown) are then fixed, and the front wall is built in.

The portion of the front wall between the bottom and middle retorts is provided with a 4½-inch arch under the top retort mouthpieces, so as to facilitate repairs, and save unnecessary blocking during that time. As the work proceeds, and previous to any retorts being put in, all flues are washed with white Purimachos cement, and subsequently all the retorts.

In repairing these settings, it is usual to pull out the front wall, examine the arches, patch the retorts, and coat with Purimachos. If the top retorts require repairs, the front wall above them must be removed, and the stays seen to, and patching then done where needful.

It will be noticed that the height of the floor of the top retort is 5 ft. 1 in. above the floor of the oven; and this makes easy working for moderate-sized men. Ample flue-room has been found to exist between the retorts, though only 3½ inches intervenes between them. Many engineers claim 4½ to 5 inches as the proper space, in which case the top retort is unnecessarily high for scoops.

As to the course of the furnace gases, it may be remarked that the heat is gradually taken to the back, down the back chamber, and then split under the bottom retort to the front, round the midfeather wall to the back of the bench, and then to the upright flue to the main flue.

Very even results are attributed to this system of heating; also the absence, while working high heats, of blocked ascension-pipes. In many settings of sixes, the bottom retorts are kept 4½ inches away from the side of the oven, or smaller-sized retorts used so as to make up the difference; the bottom and middle retorts being united by a 9-inch wall along the centre. The furnace gases pass over the middles and tops, and gradually work to the inside of the front wall, under the bottom retorts; then up the back chamber to a hole in the crown of the arch to the main flue. Experience has shown this plan to be a fruitful

source of blocked ascension-pipes, as the hottest part of the retort is the front; and the gas from the coal loses any moisture in passing over this part, and blocks are the consequence. In the setting delineated, it will be seen that it is feasible to place six retorts Ω-shape, 22 in. by 14 in. by 9 ft. inside, in an arch 7 ft. 1 in. wide by 7 ft. 9 in. to the crown of the arch, and yet obtain good heats, so as to get a yield of 8000 cubic feet of gas per mouthpiece, absence from choked pipes, and a moderate charge for materials and labour.

Where space is not such an object, in larger works than these, it would doubtless be advisable to have wider arches for seven retorts; and thus increase the width of the generator, so as to enable a poorer sample of fuel—such as breeze—to be utilized.

As to the size of the retorts, 22 in. by 14 in. seems quite small enough for a man to enter and comfortably patch up any cracks that may develop when let down.

A schedule of materials required in the setting is given in Appendix B.

A setting as described has just been taken out after having been under fire for 800 days; and this life it is hoped will be exceeded.

All the retorts are fitted with 5-inch ascension-pipes and Tangyes' mouthpieces, 18 in. by 24 in. hydraulic main, and White's combined anti-dip valves and dips. The tar is removed as it is made; and the gas is taken away in a dry main. The valves employed give admirable results, and admit of very regular yields of gas—both quantity and quality. They are usually worked so as to give 1½-10ths suction on the dry main, increased to 2-10ths if the heats are high; and no difficulty is experienced in maintaining a steady suction. The governor is locally made, and is extremely sensitive. Any extra suction is on the outlet of the condensers, which consist of a hundred lengths of 12-inch pipes. These condensers are cleaned out yearly by turning on a fire-hose at the top of each of the two sections—the bye-pass valve being opened; and the tar salts, thick tar, &c., flow out through the 6-inch seal-pipes. In case of more trouble than this, the caps are removed, and a set of three steel brushes are drawn through by means of a ⅛-inch iron chain. From this it will be seen that naphthalene is a stranger here.

Appendix A.

960	red bricks (stocks)	9″ × 4½″ × 3″
1500	Glenboig squares	9 × 4½ × 3
200	Cliff's silicon squares	9 × 4½ × 2½
15	Cliff's aluminous	9 × 4½ × 2
6	,, ,,	9 × 4½ × 1½
60	,, ,,	9 × 4½ × 1
42	,, ,,	9 × 4½ × ½
60	Cliff's bevel ends, short.	
36	Glenboig tiles	18 × 11 × 2½
80	Cliff's aluminous arch	9 × 4½ × 2½ to 2
8	Glenboig squints	5 × 5 × 5

Furnace door and frame.
Primary and secondary air-slides.
Bricklayer and labour, 160 hours each.
Concrete, about 4 cubic yards.

Appendix B.

6	Cliff's machine-made retorts	22″ × 14″ × 9′ 3″ over all.
800	Glenboig bricks	9 × 4½ × 2½
12	,, ,,	9 × 4½ × 2
24	,, ,,	9 × 4½ × 1½
48	,, ,,	9 × 4½ × 1
30	,, ,,	9 × 4½ × ½
45	Cliff's bricks, feather edge	9 × 4½ × 2½
24	,, ,, ,,	9 × 4½ × 5
75	,, silicon arch	9 × 4½ × 2½ to 2
120	,, aluminous	9 × 4½ × 2½ to 2
40	,, ,,	9 × 4½ × 2½ to 1
42	,, bevel sides, long.	
35	,, ,, medium.	
24	,, ,, short.	
8	,, aluminous saddle blocks.	
2	,, ,, tiles	24 × 15 × 2½
22	,, bevel ends, long.	
20	,, ,, medium.	
12	,, ,, short.	
22	,, soap bricks	9 × 2½ × 2½
12	cwt. Cliff's fire-clay.	
3	cwt. Purimachos, white.	
5	Glenboig sight-holes	9 × 5 × 5
3	,, ,,	5 × 5 × 5

Bricklayer and labour, 152 hours each.

Appendix C.

5800	fire bricks	9″ × 4½″ × 2½″
950	,,	9 × 4½ × 3
90	arch bricks	9 × 4½ × 2½ to 2
12	,, ,,	9 × 4½ × 2½ to 1½
30	,, ,,	9 × 4½ × 2½ to 1
450	soap ,,	9 × 3½ × 2½
70	split ,,	9 × 4½ × 1
10	,, ,,	9 × 4½ × 1½
40	,, ,,	9 × 4½ × ½
40	flat edge	9 × 4½ × 2½
35	bevel ends.	
10	,, sides.	
350	silicon squares	9 × 4½ × 2½
56	tiles	18 × 11 × 2½
12	,,	24 × 15 × 2½
20	sight-holes	5 × 5 × 5
8	,, ,,	9 × 5 × 5

5½ cwt. of Purimachos.
Bricklayer and labour, 300 hours each.
Ironwork as usual, locally obtained.

TECHNICAL RECORD.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Annual Meeting at Boston.

The Twenty-fifth Annual Meeting of this Association was held on the 13th and 14th ult. Mr. C. H. Nettleton, the President of the Association, occupied the chair; and there was a fair attendance.

Eight active and two honorary members were elected; and the President delivered an Inaugural Address. In the course of his opening remarks, he congratulated the members on the general improvement in business. The depression that marked the early part of 1894 appeared to be passing away; and, generally speaking, there was an improvement in the demand for gas. In his own neighbourhood, there had been what seemed at one time to be serious competition by the introduction of a system of supplying oil from a central store-tank, through pipes to fixtures in the different rooms of a house; but the use of this system was now falling off. The incandescent gas-burner was discussed at some length. The President appeared to have realized the advantages usually claimed for this form of light in actual practice; and he regarded it as a very strong competitor with electricity. Great importance was attached to pushing and developing the sale of gas in every possible way, and to liberal action in the matter of laying services, fixing meters, and supplying stoves. It was worth while going to some expense to get new custom; and he was a firm believer in the policy of vigorously canvassing for customers. The action of The Gaslight and Coke Company in London was instanced as a case in point. The President concluded with a brief reference to gas-motor cars, the federation of gas associations, and municipal ownership.

A discussion was held on the best course to pursue when a person is overcome by gas inhalation. Mr. Lamson mentioned that free oxygen had been used in such cases with great success; and he said that a physician (Dr. Amory), who was present, could give some valuable information. Dr. Amory, at the invitation of the President, addressed the meeting. He said that, when studying medicine in Paris, one of the subjects given to him for investigation was poisoning by charcoal fumes; and he soon found that the real question was the difference between carbonic acid and carbonic oxide. The former was non-poisonous, but did not support life. It therefore acted negatively by keeping oxygen away. A man died in an atmosphere of carbonic acid, for the simple reason that he could not get sufficient oxygen to support life. Carbonic oxide not only stifled, but was positively poisonous. It formed a compound with the colouring matter of the blood, which was not distinct and stable during life. Later on, he had some practical experience in cases of poisoning by coal gas and by water gas. In one case, a man became unconscious from breathing blue water gas, but revived on being taken into the open air and shaken. He found that a large proportion of carbonic oxide induced sudden unconsciousness; and this was not so marked in cases of coal-gas poisoning. In fatal cases from coal gas, convulsions set in just before death; but this symptom was absent in carbonic oxide poisoning. The object of giving soda water or seidlitz powders was to irritate and distend the stomach; and this in turn irritated the diaphragm, and caused the lungs to empty themselves by a gasping effort. When emptied, the lungs filled themselves, just as in the case of a new-born infant. If there is a difficulty in taking the first breath, cold water is thrown on the naked body, the infant gasps, and its lungs are filled. This was the reason for using soda or seidlitz powders, and for shaking or otherwise irritating the patient. Whisky was not of any use. He was told that ammonia water had been employed with success. Resorting to artificial respiration was a rational mode of treatment, as the signs that appeared after death from carbonic oxide poisoning were exactly similar to those following death from drowning. He proceeded to remark on the instructions for inducing artificial respiration, as given by the Humane Society. When recovery commenced, friction applied to the surface of the body would be helpful. But he explained that the first efforts at artificial respiration should not be hurried, but taken slowly—say, 12 per minute, gradually increasing to 18. When the person began to breathe, the best treatment was the inhalation of oxygen; but if the patient could not breathe, the oxygen could not get into the lungs.

In reply to questions, Dr. Amory said that the unconscious patient should be laid flat on his back; and in obstinate cases, the feet might be raised. A warm temperature was helpful; remembering that good ventilation must be maintained. He recommended every gas man to study the instructions for cases of drowning. As soon as the patient had enough oxygen, he would experience discomfort, and ask for it to be stopped. He might remark that accidents with electricity produced very similar results; and the same treatment would do. The efforts to make the patient breathe should be kept up for half an hour or more.

Mr. J. E. Nute, of Fall River (Mass.), read a paper on "The Effect of the Introduction of the Welsbach Light on the Business of Gas Companies." He said there was some doubt as to the attitude to be taken towards the new burner. Was it

to be welcomed as a valuable competitor with oil and electricity? Or would the reduced consumption more than affect the gain in that direction? He introduced the burner at Fall River two years ago; and now he had 2300 in use. Of this number, 520 replaced ordinary gas-jets; 387 took the place of electric lights; 330 were substituted for oil-lamps; and 259 were new and additional consumption. He had reason to believe that the number under the first head was too large; and that under the third head, too small. Assuming a loss of 2 cubic feet per hour by substituting a Welsbach burner for an ordinary jet, there was a loss of over 1000 cubic feet per hour. But there was an actual gain of 717 lamps, or over 2000 cubic feet per hour; so that there was a net increase of about 1100 cubic feet per hour, apart from the 259 new lamps. He considered this a proof that the Welsbach burner was worth introducing, as it largely increased his sales.

The President thought Mr. Nute had conclusively shown that it paid to introduce the Welsbach burner at Fall River; and he hoped there would be a full discussion on this important topic. Mr. Addicks understood that Mr. Nute was not working the electric light in connection with his Company; and he said that it was important to know whether each speaker was simply supplying gas, or electric light in combination. Mr. Gifford was operating both gas and electricity; and he found that 80 per cent. of the Welsbach burners he had fixed superseded electric lights, and 20 per cent. replaced ordinary gas burners. Therefore, while no business had been lost to them, they had certainly been deprived of some income; but he believed in seeking the interests of the consumers, and thought this would eventually correct itself. He had no means of ascertaining how many oil-lamps were replaced, but expected some advantage in that direction. Mr. Lamson said that, though the Welsbach burner had displaced a great many large gas-burners, it had also dislodged electric lights and oil-lamps; and he believed it would eventually be helpful to his Company. It was certainly more artistic and graceful than ordinary burners. Mr. Taber also thought that the Welsbach burner was a friend to the gas company. It would enable gas to recover its position for high-class lighting in drawing rooms and boudoirs; and it was safer than naked flames for shop windows. Mr. Parker had recently adopted the Welsbach burner; and so far the results were very satisfactory. Mr. Rossman introduced them five years ago. They almost entirely displaced kerosene; and a few months since, he tried to start an incandescent electric lighting system, but could not obtain any support. Mr. Lane was employing the Welsbach burner with satisfactory results. Mr. Todd also found it would compete successfully both with electricity and oil. Mr. Coggeshall, as working a combined gas and electric, plant, said the Welsbach burner was no friend to him. It was displacing his incandescent electric lights, and reducing his income; and had he known of it in time, he would have let electric lighting alone. Mr. Coffin said his experience was similar to that set forth in the paper—there was a clear net gain by introducing the burners. Mr. Addicks thought it was evident that gentlemen who were also running electric plants did not think so highly of the Welsbach light as the rest. He was satisfied that it could be used by ordinary consumers with advantage and satisfaction. Mr. Chollar said that the system had been largely adopted at St. Louis; and taking it altogether, it had greatly increased the output and the profit of the Company.

(*To be continued.*)

THE MANUFACTURE OF CARBIDE OF CALCIUM BY ELECTROLYSIS.

In view of the interest attaching to the above subject, the Editor of the *American Gaslight Journal* asked Mr. F. Bredel to prepare an article thereon. He complied with the request; and the following communication appeared in the number of our contemporary for the 25th ult.:—

The process is similar to the manufacture of carbon silicon (carborundum), and is effected by subjecting fresh-burned lime, in the presence of carbon, to the heat of the electric arc, when two reduction processes become possible—

(1) $2CaO + C + 4C = 2CaC_2 + CO_2$; or,
(2) $CaO + C + 2C = CaC_2 + CO$.

The latter formula seems the more probable, as the carbon dioxide formed in the first process would be reduced to carbon monoxide if subjected to the heat of the arc in the presence of carbon.

The energy required to make the reduction according to formula No. 2—viz., 56 grms. CaO + 36 grms. C = 64 grms. CaC_2 + 28 grms. CO—is as follows:—

Heat absorbed by heating 24 grms. C to the heat of the electric arc—	Calories.
24 × 3000 × 0·46*.	32·12
Reduction of 56 grms. CaO to 40 grms. Ca 16 grms. O† . .	132·00
Total heat required	164·12
Heat produced to burn 12 grms. C to 28 grms. CO. . . .	28·59
Net heat required.	135·53

* Heat of electric current taken as 3000° C.; specific heat of coke = 0·46.
† See Naumann, 82, p. 511.

In the formula, no attention is paid to the formation heat of Ca 2C = CaC_2, which can either be positive or negative; but as in both cases it can only be very small, it may be left out.

The aforesaid amount of heat is required to make 64 grammes of calcic carbide, or, per kilogramme, (1000 × 135·53) ÷ 64 = 2117·6 calories. Add 15 per cent. for loss by radiation, and the total heat required to make 1 kilo. of CaC_2 is 2435 calories. As 1 electric horse power is equal to 637 calories, of which possibly 80 per cent. could be obtained by electrolysis, or the energy of 1 electric horse power = 637 × 0·80 = 510 calories, to manufacture 1 kilo. CaC_2, 2435 ÷ 510 = 4·78 electric horse power are required.

Besides the above energy, there are required—

(1) Carbon to burn out O in CaO = $\frac{12}{56}$ of the weight of CaC_2.
(2) Carbon to combine with Ca to CaC_2 = $\frac{24}{64}$ of the weight of CaC_2; or, in total, 36 kilos. C for every 64 kilos. CaC_2, or 56·6 kilos. C per 100 kilos. CaC_2, or about 60 kilos. of coke per 100 kilos. CaC_2, taking ashes and moisture into consideration.
(3) Lime to be reduced to Ca = $\frac{56}{40}$ of the weight of CaC_2, or 87·5 kilos. CaO per 100 kilos. CaC_2; or expressed in best commercial, fresh-burned lime, about 95 kilos. per 100 kilos. CaC_2.

The cost of manufacture and distribution would therefore consist of the following items per 1000 kilos. CaC_2: (1) Electric horse power to transform into heat 4780 horse power; (2) powdered coke to burn out the oxygen, and combine with the calcium, 600 kilos.; (3) fresh-burned lime, powdered, 950 kilos.; (4) cost of transforming high-potential into low-potential current (loss in transformer); (5) cost of carbon; (6) repair of furnace; (7) labour; (8) packing in air-tight barrels and cost of same; (9) freight from place of manufacture to place of consumption; (10) office expenses, interest on plant, working capital, royalties, taxes, &c.

Taking it for granted that cheap electric power (Niagara water power) could be utilized, the lowest price obtainable would possibly be $15 per electric horse power per annum of 310 × 24 = 7440 horse-power-hours of a pressure of 2000 volts; wherefore the amount of power required per 2000 lbs. would be 4302 instead of 4780 per 1000 kilos.

When water power is not at hand, to raise the necessary amount of power required by coal under the steam-boiler would cost probably three times as much, taking cost of attendance on boiler, engine, and dynamo, repairs, oil for lubricating, interest on power plant, and everything into consideration. The best that could be done would be from $40 to $45 per electric horse power with run of mine coal (say) at $1 per ton delivered at factory. The consumption of run of mine coal is 1·6 lbs. per horse-power-hour when using triple-expansion inverted engine (marine type). The following calculation is based on water power at $15, and an output of at least 15 tons of material per day, which would require about 2700 horse power per day of 24 hours, and result in production of material equal to a make of 1,500,000 cubic feet of 20-candle gas. The cost of 2000 lbs. of calcium carbide would therefore be—

(1) Horse power = (4302 × 15) ÷ 7440 . . .	$8·67	
(2) 1200 lbs. of powdered coke at $3 per ton . .	1·80	
(3) 1900 lbs. of powdered lime at $5 per ton . .	4·75	
(4) Cost of transforming current, or loss of 10 per cent.	0·88	
Cost of power and raw material		$16·10
(5) Cost of carbon for 4302 horse-power-hours .	$4·30	
(6) Repair of furnace	2·50	
(7) Labour	1·00	
(8) Packing and barrels	0·60	
(9) Freight	4·00	
Cost of manufacturing and freight. . . .		12·40
Total net expenses		$28·50
(10) Office expenses, plant, royalty, taxes and interest, 40 per cent. of above		11·50
Total cost per 2000 lbs. CaC_2		$40·00 = £8 6s. 8d.

Item No. 10 might seem high; but it is, in fact, very low. On an output of 15 tons per day, or 4680 tons per annum, at $11·50 per ton, it would only amount to $53,820. Figuring the office expenses at (say) $20,000, there is only left $33,820 to pay the interest, royalties, taxes, &c.

Value of Calcium Carbide for the Manufacture of Acetylene, and the Illuminating Value thereof.

When water is slowly dropped on calcium carbide, the following reactions are possible:—

$CaC_2 + H_2O = CaO + C_2H_2$; or,
$CaC_2 + Aq. = Ca(OH)_2 + C_2H_2$.

A pound of calcium carbide makes practically about 5 cubic feet of acetylene gas (theoretically about 5·7 cubic feet), or a ton will produce 10,000 cubic feet, with an illuminating power of from 200 to 250 candles per 5 cubic feet, or a gas ten times as good as a 20-candle power illuminating gas.

Now, 10,000 cubic feet of acetylene cost on calcium carbide $40, and are equal to 100,000 cubic feet of illuminating gas of 20-candle power; or 100 cubic feet of acetylene are equal to

1000 cubic feet illuminating gas, and the cost is 40 c. for calcium carbide alone.

Comparison of the Amount of Light Produced by One Horse Power Used in Manufacture of Acetylene, against Incandescent Lighting.

A ton of calcium carbide makes 10,000 cubic feet of acetylene of 20-candle power per cubic foot, or 200,000-candle power per ton, and requires 4302-horse power. To produce 200,000-candle power incandescent light, 200,000 ÷ 160 = 1250-horse power are required (1-horse power feeding ten 16-candle lamps). Distribution, cost of plant, carbon, and all other expenses, are about alike in both processes.

ACETYLENE AS AN ILLUMINATING GAS.

A German View of the Subject.

The following is the substance of a review of the prospects of the commercial production and application of acetylene which appeared a short time since in the pages of the *Journal für Gasbeleuchtung*. It is interesting as an epitome of the views of our German contemporary on the subject.

Electro-chemical researches, which at one time were of purely scientific interest, have recently promised to be of immense value in the field of gas manufacture. Thus acetylene was produced from calcium carbide; and now the application of this method of producing it is vigorously discussed, with a view to the employment of acetylene as a lighting agent *per se* or as a means of enriching other gas. Acetylene occurs in small quantity in coal gas; but its manufacture must be considered as the result of the interesting experiments of the French chemist, Moissan, who by the aid of the electric arc produced the carbides—a series of remarkable compounds of metals with carbon. Calcium carbide, which is used for the manufacture of acetylene, is obtained by fusing in the electric furnace quicklime and coal-dust, in very similar manner to the production on a large scale of aluminium from alumina. Calcium carbide has the composition CaC_2; and it is formed according to the equation $CaO + 3C = CaC_2 + CO$, carbonic oxide therefore escaping. It is a dark gray body, of stony appearance, and decomposes with water into lime and acetylene according to the equation $CaC_2 + H_2O = CaO + C_2H_2$. One pound of calcium carbide yields 0·4 lb. or 5·60 cubic feet of acetylene, which gives, in suitable burners, an unusually brilliant flame. These facts have been known for a long time, and are of great interest for the study of acetylene, which formerly was only obtained by cumbrous methods. Excitement was, however, roused a short time ago by reports from America that the Manager of the Willson Aluminium Company at Spray, North Carolina, had succeeded in producing calcium carbide, and consequently acetylene, so cheaply that the gas would rank as one of the cheapest obtainable. According to Dr. Francis Wyatt, who prepared a report for the American *Engineering and Mining Journal*,* 2000 lbs. of calcium carbide produced by electric current derived from water power costs £3 2s. 6d. apportioned as follows: 1200 lbs. of coal-dust, 10s. 6d.; 2000 lbs. of powdered quicklime, 16s. 8d.; 180 electrical horse power obtained from water power at 2s. 1d. per hour for twelve hours, £1 5s.; wages, 10s. 4d. Total for 2000 lbs. of calcium carbide, £3 2s. 6d. Now according to the above statements, one ton of calcium carbide decomposed with water should yield 12,700 cubic feet of acetylene; and therefore 1000 cubic feet should cost about 5s. 6d. A modest doubt as to the correctness of this computation cannot be suppressed; and a critical examination of it is reserved. But it may be pointed out, that by the statements of Moissan, the discoverer† of calcium carbide, a current of 350 amperes at 70 volts for fifteen to twenty minutes is necessary for the production of 4·2 oz. to 5·3 oz. of calcium carbide. To obtain this current, at least 36-horse power is necessary per hour; and, with first-rate steam-engines, this would cost about 1s. 4½d. (in Germany). Consequently the cost of the current alone for the production of 1 lb. of calcium carbide would be about 1s. 4½d. According to this, the cost of 1000 cubic feet of acetylene would rise to about £12. With regard to the illuminating power of acetylene, and its value as an enricher of coal gas, they can hardly differ substantially from those of benzene (C_6H_6), the polymer of acetylene (C_2H_2) and the most important illuminant in coal gas. At the present time, 1 lb. of benzene costs (in Germany) about 1·6d.; and from the above calculation the same weight of acetylene should cost 41d. So that, for the present, enrichment by acetylene would appear to be twenty-five times as dear as that by benzene. This conclusion should somewhat smother the unwarranted enthusiasm with which acetylene gas has been received in America and England. But though the cost of acetylene should prove far less favourable than from the estimates of Wyatt, yet its cheap production lies so far within the range of probability, and it has such undoubted importance as a lighting agent on technical and scientific grounds, that the great interest aroused towards it is justified. Its development will, therefore, be attentively watched.

Mr. Will Thorne, the General Secretary of the Gas Workers' and General Labourers' Union, has been invited to contest the Parliamentary vacancy at Bristol, in the Labour interest.

* See JOURNAL for Jan. 15, p. 120. † See *Comptes Rendus*, 1894, p. 501.

THE FLAME-EXTINGUISHING PROPERTIES OF CARBON DIOXIDE AND NITROGEN.

At a recent Meeting of the Nottingham Section of the Society of Chemical Industry, Dr. F. CLOWES, Professor of Chemistry and Metallurgy at University College, Nottingham, gave an account of a series of experiments carried out by himself and Mr. M. E. Feilmann, with the object of ascertaining the minimum proportions of carbon dioxide and of nitrogen which, when mingled with air, are extinctive to the flame of various combustible gases and liquids. An abstract of the communication, with a report of the remarks to which it gave rise, appeared in a subsequent number of the Society's *Journal*, from which the following particulars have been taken.

Professor Clowes explained that the method of experiment consisted in mixing the measured volumes of air and of the ga by the motion of a light ball, so as to avoid the solvent action of water on carbon dioxide. After proving that the method yielded mixtures accurately in the desired proportions, the trials were made by introducing the experimental flame into mixtures of air and gas, which were varied in proportion until the flame was immediately extinguished, but continued burning for a short time in a mixture containing 1 per cent. less of the extinctive gas. The influence of the products of combustion was eliminated by this procedure. It was found that the size of the flame had no influence on the extinctive proportions. The following table summarizes the average results obtained :—

Combustible Substances Burnt.	Extinctive Proportion of Carbon Dioxide Added to Air.		
	Percentage Added.	Percentage Composition of Mixture. O	(N+CO₂).
Alcohol (absolute)	14	18·1	81·9
Do. (methylated)	13	18·3	81·7
Paraffin (ordinary lamp oil)	15	17·9	82·1
Colza oil with equal volume of petroleum	16	17·6	82·4
Candle	14	18·1	81·9
Hydrogen	58	8·8	91·2
Carbon monoxide	24	16·0	84·0
Methane	10	18·9	81·1
Ethylene	26	15·5	84·8
Coal gas	33	14·1	85·9

Combustible Substances Burnt.	Extinctive Proportion of Nitrogen Added to Air.		
	Percentage Added.	Percentage Composition of Mixture. O	N
Alcohol (absolute)	21	16·6	83·4
Do. (methylated)	18	17·2	82·8
Paraffin (ordinary lamp oil)	23	16·2	83·8
Colza oil with equal volume of petroleum	22	16·4	83·6
Candle	22	16·4	83·6
Hydrogen	70	6·3	93·7
Carbon monoxide	28	15·1	84·9
Methane	17	17·4	82·6
Ethylene	37	13·2	86·8
Coal gas	46	11·3	88·7

The results obtained show: (1) That carbon dioxide exerts a uniformly more powerful extinctive effect than does nitrogen. This may possibly be partly due to its high density, which renders the movement of air to feed the flame sluggish. (2) That the different wick-fed flames are extinguished by a strikingly uniform proportion of the extinctive gas. These flames were noticed to gradually diminish in size and die down; evidently owing to the supply of combustible material to the flame being diminished in amount by the reduction in temperature of the flame. (3) That the extinctive proportion for the various gas-fed flames varied widely, and did not appear to be deducible from the composition and chemical nature of the gas which was burnt. The extinctive proportion for a coal-gas flame was much larger than that for the wick-fed flames; while the extinctive proportion for the hydrogen flame was extraordinarily high.

The gas-fed flames increased in size during the process of extinction, instead of diminishing as in the case of the wick-fed flames. This appeared to be due to the fact that the supply of combustible was maintained independently of the flame itself, and that the flame had to increase its surface in order to obtain the supply of oxygen necessary for its combustion in air containing a diminished proportion of that gas.

Attention was directed to the practical advantage derivable from the large proportion of carbon dioxide (58 per cent.) necessary to extinguish the hydrogen flame. The author had described an ordinary miner's safety-lamp, in which a hydrogen flame could be burnt at will instead of the oil-flame for the purpose of delicate and accurate gas testing.* It was now found

* See JOURNAL, Vol. LXIV., p. 371.

that by burning the flame of hydrogen beside the oil-flame in parts of the mine where the atmosphere might contain large amounts of carbon dioxide, the extinction of the oil-flame was not attended with loss of flame in the lamp, since the hydrogen flame never suffered extinction, and served to rekindle the wick in fresh air after the oil-flame had been extinguished by a foul atmosphere. This had proved to be a great convenience to exploring parties in a mine after a fire or an explosion; and it was the direct consequence of the resistance of the hydrogen flame to extinction by carbon dioxide.

Professor Clowes went on to say that recent experiments, carried out by Mr. J. R. Wilson on rabbits, had thrown considerable doubt upon the statement that the proportion of carbon dioxide in the air which extinguished the flame of oil or a candle was irrespirable. This, however, was a matter to be decided by physiological experiments. But it might be taken as finally established by the experiments he had just described that about 15 per cent. of carbon dioxide was at once extinctive to ordinary illuminating wick-fed flames, although 33 per cent. was requisite to at once extinguish a flame of coal gas, while a hydrogen flame did not suffer extinction until 58 per cent. of carbon dioxide was present in the air.

In the course of the discussion on the paper, Mr. G. J. Ward remarked that in his case they were in the habit of burning under their boilers waste gas from the blast-furnaces. Roughly speaking, the gas contained 30 per cent. of carbon monoxide, 6 per cent. of carbon dioxide, 4 per cent. of hydrogen and hydrocarbons, and 60 per cent. of nitrogen. Approximately, 85 per cent. of air was required to burn the mixed gases. After the addition of air, the mixture would contain about 89 volumes of carbon dioxide and 11 volumes of oxygen in every 100 volumes of non-combustible gases—a mixture which was extinctive for carbon monoxide, according to Dr. Clowes's experiments, and yet combustion took place under their boilers. He asked if Dr. Clowes could explain this. Mr. R. L. Whiteley did not agree with the argument that, because a rabbit could live in air which contained a certain large percentage of carbon dioxide, a human being could also live. He thought that animals accustomed to living above ground should be experimented upon, if anything like satisfactory conclusions were to be arrived at. Dr. Stafford said there seemed to be some considerable difference of opinion with regard to this matter. Recent experiments tended to show that they had been accustomed to over-estimate the dangerous qualities of carbonic acid gas as a constituent of respiratory air. Considerable quantities of carbon dioxide might be added to air before it became fatal to an animal breathing it. In this connection, Dr. Whitelegge had spoken of carbon dioxide in respiratory air as the "harmless index." It would appear that the use of oil-stoves for warming rooms, in place of open fires, was not so objectionable as might appear. Providing that the combustion of the oil is complete, the carbon dioxide produced did not appear to be harmful—fairly adequate ventilation being allowed for. Recent research seemed to show that the deleterious properties of expired air lay more in the volatile organic material given off than in the carbon dioxide expired. Mr. F. J. R. Carulla referred to the power of the lamp to keep a flame alight in atmospheres where the oil-flame went out. This seemed to him to be an extremely valuable discovery.

Replying to the remarks, Dr. Clowes said that the conditions under which the furnace gas mentioned by Mr. Ward was burnt, were sufficiently unlike those of his own experiments to account for the difference in the result. Part of the extinctive gases was mixed beforehand with the combustible gas; and the combustion of hot gas took place in a heated space, which would tend to maintain the flame. He remarked also that hydrogen was present as well as carbon monoxide. The conditions were therefore entirely different from those under which he had worked; and the conclusions arrived at in the paper were not applicable to Mr. Ward's case.

Mr. J. R. Wigham on Lighthouse Illuminants.—Last Friday afternoon, Mr. J. R. Wigham, M.R.I.A., the President of the Dublin Chamber of Commerce, read a paper before the Shipmasters' Society, at the London Chamber of Commerce, on the subject of "Gas Lights, Oil Lights, and Electric Lights as Lighthouse Illuminants." In the course thereof, he remarked that, up to the time of the introduction of gas, there were no means by which the light-keeper could increase the power of his light in thick weather. He (the lecturer) had constructed a burner having six powers, which could be added according to the state of the weather by means of rings of jets; and a light-keeper could almost instantaneously increase his light. With regard to oil, light mineral oil was used now in most lighthouses. Following the example of the gas-burner, the larger sizes of the oil-lamps (Fresnel's) were provided with means by which the light could be increased in thick weather; additional wicks being lighted. As to the electric light, its dazzling splendour was captivating, and its diminutive size charming to optical engineers. But the late Professor Tyndall gave it as his opinion that, for lighthouse purposes, it was magnificent in clear weather, and worthless in fog. Mr. Wigham said he thoroughly agreed with this opinion. It was justified by the experiments carried out in connection with the signal-light at the House of Commons, the result of which was the adoption of gas on account of its having greater penetrating power than the electric light. The lecturer treated of superposed lenses, group flashing, and sky flashing. The last-named system had, he said, been tried in the course of the South Foreland experiments, and had been highly eulogized by Admiral Sir L. M'Clintock and his colleague Captain Vyvyan; but it had not yet been adopted. By far the most important advance made in lighthouse lenticular apparatus was the "giant" lens, which did justice to the large lighthouse gas-burners. It had not, however, been taken up by the lighthouse authorities of this country, owing, as he understood, to the impecunious condition of the Mercantile Marine Fund, though he believed the Americans intended to use a lens of the kind in the new lighthouse on Fire Island, off New York Harbour. The paper was illustrated by working models; and a discussion followed.

Mr. H. C. Burdett on the London Water Companies.—The volume of statistics issued annually by Mr. H. C. Burdett, the Secretary to the Share and Loan Department of the Stock Exchange, under the title of "Burdett's Official Intelligence," contains a special chapter on the London Water Companies. Last year, owing to the circumstances of the time, this was confined to a single page; but in the present issue (the fourteenth), the subject is dealt with at much greater length—in fact, more on the lines of the 1893 edition. Mr. Burdett goes back to the recommendations of the Select Committee of 1880; and, dealing with the late Mr. E. J. Smith's calculations, he shows that the average increase in the Water Companies' incomes in the past twelve years is £10,807, as compared with an average increase of £22,054 in the annuities granted by Mr. Smith by way of deferred stock for the same period. He estimates that the abandonment of that scheme caused a loss of close upon £800,000 to the ratepayers, assuming certain economies in working expenses could have been realized. He next passes on to deal with the question of purchase on the basis of market value; and he states that the value of the ordinary capital, as gauged by the prices ruling for shares, has increased since 1879 to the extent of about 43 per cent., and that of the entire undertakings by about 52 per cent. The chapter closes with the conclusions of the Royal Commission of 1892-3, and some remarks on the Water Companies' legislation of the past and present sessions, and on the latest action of the London County Council. He says a careful perusal of the Water Bills promoted by that body leads him to endorse most heartily the following remarks made by the present Chancellor of the Exchequer to a deputation in 1893: "I cannot myself accept the proposition that you can deal with the Water Companies or any other person by simply repealing their rights, and making their rights what you choose them to be." For fuller particulars on all these matters, we must refer the reader to the volume itself, which is published by Messrs. Spottiswoode and Co., of Grace-church Street, E.C.

Some Modern Methods of Lighting Compared.—This was the title of a paper contributed to the last meeting of the Carlisle Architectural, Engineering, and Surveying Society by Mr. Thomas Glover, who has just received the appointment of Engineer and Manager of the West Bromwich Corporation Gas-Works. Starting with a brief history of the origin and extent of gas lighting, Mr. Glover defined the necessary qualities of artificial light to be: Steadiness, reliability, convenience, safety, and freedom from all injurious properties likely to cause air pollution or injury to health. A table exhibited demonstrated that all illuminants, with the exception of the electric light, caused air pollution; but contrary to ideas prevalent in many people's minds, gas caused the formation of less carbonic acid, light for light, than either oil or any description of candles. Apart from the question as to the method adopted for lighting an apartment, in order to secure a sweet atmosphere, it was necessary to have some method of ventilation; and a simple plan was described which might be used for ordinary living rooms. The propriety of enriching a poor gas of say 15-candle power to 19 candles by means of cannel costing 1½d. per candle per 1000 cubic feet was held to be questionable; but there could be no doubt as to the wisdom of enrichment by means of oil gas at ½d. per candle per 1000 cubic feet. The importance of good fittings was shown in a striking way experimentally; and the desiderata for a good burner were enumerated. Attention was bestowed upon the use and advantages of governors, fixing these on the burners themselves being preferable to the fixing of one governor close to the meter. In the former case, the advantages of higher pressure to stoves, &c., might be realized. The regenerative lamp was then described, together with the Welsbach incandescent gas-light, which the lecturer considered one of the greatest advances made in the science of gas-lighting to popularize its use, and to compete successfully with the electric light. The use of petroleum oil as an illuminant was then touched upon; and finally the electric light was considered. Its weak point, the author contended, was the loss that occurs in the conversion of coal energy into electric energy, and in the distribution of the two illuminants; the loss in gas distribution being from 4 to 10 per cent., while in electricity the leakage sometimes amounts to 40 per cent. The failure from an economical view of accumulators also militated against the success of electricity; though Mr. Glover said he expected to see further strides made in the progress of the science in a few years. The lecture was illustrated by many drawings, diagrams, and specimens of lamps, burners, meters, &c.

REGISTER OF PATENTS.

Carbonizing Coal in the Manufacture of Coal Gas.—Wilton, T., of Beckton. No. 5540; March 16, 1894.

The main object of this invention is "to materially reduce the present excessive wear and tear of retorts and their settings (caused by external heat), and hence the cost of maintenance." By the invention also fuel and labour "are economized, and less time is occupied during and in the manufacture of gas, and a practically uniform temperature in the retorts, which is of great importance." Further, the patentee arranges "for the better carbonization of gases evolved from coal, by circulating same as frequently as may be required over and amongst the coal during its carbonization."

In the arrangement illustrated, a series—composed of any suitable number—of comparatively short and superposed horizontal (or they may be inclined) cast-iron circular retorts R^1 R^2 R^3 R^4 are employed, connected to each other at alternate ends. The lowest retort of the series over the furnace F alone is of fire-clay, as here the greatest wear and tear occurs. Coal is fed through a double-valved hopper to one end of the uppermost cast-iron retort of each series; and each retort, except the lowest one, is provided with an internal conveyor at C, by which the coal is gradually travelled along the retort to the end, and then drops through the end connections to the next retort, wherein it is travelled back; and so on to the inclined fire-clay retort R. This is set at such an angle as to prevent the resting of the carbonized coal or coke therein, and deliver it to the lower end, which is sealed as usual, and provided with a mouthpiece M and rising-pipe P to deliver the gas. In connection with the delivery-end of the retort R^1, next the inlet end of the lowermost fire-clay retort R, an arrangement may

Fig. 2.

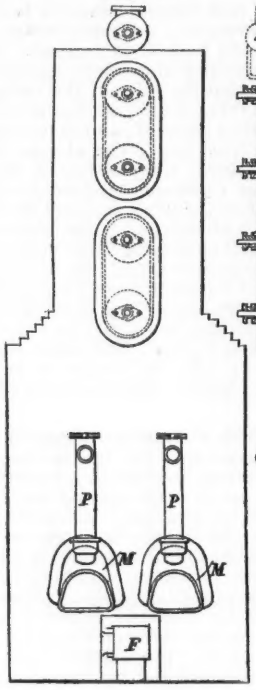


Fig. 1

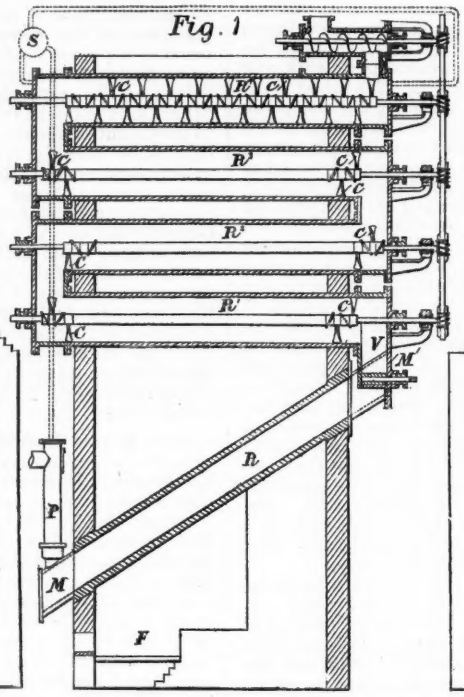
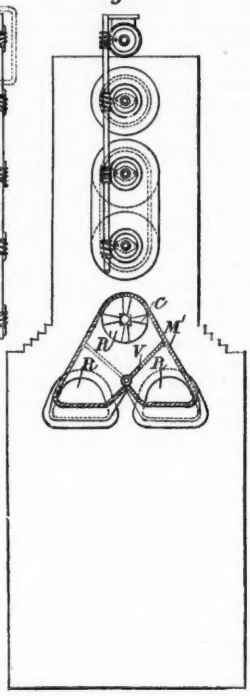


Fig 3.



be employed consisting in duplicating the fire-clay retort R, and attaching a cast-iron mouthpiece M^1, enclosing the end of the lowest cast-iron retort R^1 and the upper ends of both the fire-clay retorts R. In this is fitted a three-way valve V, either pivoted as shown, or two sliding gas-tight valves may be used working through slots in the sides of the mouthpiece. In either case, they are adapted to connect the retort R^1 with either of the retorts R while shutting off the other. Thus the discharge of gas and coke can be continued down one of the inclined retorts while the other is being cleared from its lower end.

The retorts are set in brickwork, in such manner as to expose only a certain section of the lower part of each to the waste gases from the underlying furnace required for heating the fire-clay retort section; the upper parts being protected against the action of the heat. The conveyors (geared as shown) are driven at suitable speeds, and in the required directions, by power.

In combination with apparatus for accomplishing the methods here indicated for the purpose of effecting the more complete and effective carbonization of the gas evolved from the coal, the patentee proposes to cause the gas to be circulated throughout the whole system as frequently as may be required. For this purpose, he employs an exhauster, blower, or fan, as indicated at S, connected by pipes to one of the retorts—for example, to either end of the top one R^4—and to the rising-pipe P, in such manner as to cause the gases to be drawn or forced from the pipe P into the retort R4, and over and through the whole system of hot retorts, among the incandescent coal, again and again as frequently as required. The superfluous gases escape to the hydraulic main, so as to readily maintain a level gauge; and by this circulation, it is claimed, more perfectly carbonized gas is produced.

By the above arrangement, says the patentee, only a thin layer of coal (which is a bad heat-conductor) is allowed to exist upon the lower part of the metallic retort; and since it is continually moved along, carbonization is more rapid than in ordinary sealed retorts with the usual thick layer of coal. And, further, that part of each group or series of retorts which is exposed to the fiercest heat is made of fire-clay, and can be renewed when required without disturbing the rest of the series of retorts and the settings and accessories. Among other advantages accruing from the arrangement set forth is "more uniform temperature in the retorts; and owing to this, together with the fresh coal supply, and the constant movement, the make of gas is considerably increased, and more ammonia is obtainable (since none is destroyed by extreme variations of temperature)." The practical uniformity of temperature obtained by the invention is said to have the effect, in fact, of producing "the greatest possible volume of gas from the coal distilled."

Gas and Mineral Oil Engines.—Adams, S. H., of York. No. 6364; March 30, 1894.

This engine is designed specially for use with gas, mineral oils, or other similar agents; the patentee's proposal being to abandon entirely the ordinary crank motion, and construct the cylinder as an ordinary cylinder, by preference adopting the type of the present gas or oil engine cylinders. The piston is so arranged that, while oscillating backwards and forwards freely, it cannot revolve in the cylinder. The piston-rod is extended to any length; and bearings are provided where needed, to take its weight and keep it in the position required when in work. Upon this piston-rod are arranged a series of threads or turns, or a certain length of screw. Now it will be evident that, as the piston is drawn backwards and forwards within the cylinder by the force of the agent employed, the rod with its screwed portion will also be drawn backwards and forwards, and that when a fly-wheel, whose boss is bored and screwed to correspond, is held in position, it causes the piston to work backwards and forwards—the nut or fly-wheel thereon revolving as an Archimedian screw or drill does. For the purpose of the invention, the fly-wheel need only revolve in one direction; and to ensure this, only the forward thrust of the piston is utilized—allowing the fly-wheel to revolve freely at intervals by its own momentum. The necessary engaging with, and disengagement from, the piston-rod is attained by means of a clutch or other contrivance; and having thus secured continuous rotary motion on the fly-wheel, the engine can be readily arranged to drive any desired machinery.

Gas-Engines.—Low, P. A., of Thames Ditton. No. 6755; April 4, 1894.

This invention refers to gas-engines working on the "Otto" cycle, with two tandem cylinders, having an explosion, once every stroke, in alternate cylinders. In such engines, the compression of air is usually employed to ensure the moving parts being kept in "constant thrust;" and the present proposal is intended to allow of this being accomplished though the air supply is diminished in quantity or altogether cut off.

To accomplish this, the air and gas are admitted into the space under the upper piston (the "receiver"), and from this are transferred alternately to the top and bottom cylinders. If the air and gas are cut off, there will be a vacuum formed under the top piston, which will keep the moving parts from flying upwards at the top of the stroke. For admitting the mixture of gas and air below the top piston, and from thence to the working end of one or other of the cylinders, and for controlling the exhaust, balance piston-valves are used. One such balanced valve, acted on by a governor, controls the supply of gas and air or gas only—one piston of the balance valve controlling the opening by which gas is admitted, and the other the opening through which air is admitted to a passage leading to the second balanced piston-valve. The second piston-valve is worked by an eccentric on the crank-shaft. In the cylinder in which this pair of pistons work are three sets of ports—the middle set opening into the receiver space below the top piston, so that this space may always be open to the space between the pair of

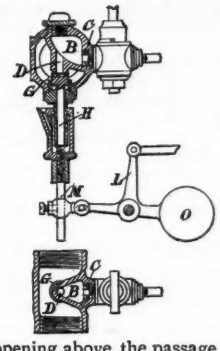
pistons; a second set opening to the gas and air supply passage, and closed or opened by one of the pistons of the pair; and the third set opening into a passage which leads to the third balanced valve, and which is always open to the space between the two pistons of the third balanced valve. This space may be divided by a third piston between the other two, so as to reduce the capacity of it. The third set of ports are, by the second piston of the balanced pair, either opened to the exhaust or to the gas and air receiver. In this way, the receiver space can, by the to-and-fro movement of the balanced valve, be alternately placed in communication with the air and gas supply, while at the same time the space between the pistons of the third balanced valve is opened to the exhaust; or this space between the pistons of the third balanced valve can be put in communication with the air and gas receiver. The third balanced valve is worked by an eccentric, which makes half a revolution for each revolution of the crank-shaft. One of the pistons of this pair controls the opening or closing of ports leading to the working end of one cylinder; the other controls the opening or closing of ports leading to the working end of the other cylinder. Consequently, during one down-stroke and one up-stroke of the pistons, the space between the two pistons is in connection with the working end of one cylinder; and during the next up-stroke and down-stroke of the pistons, it is in connection with the working end of the other cylinder.

The result of this arrangement is that the receiver is on every up-stroke filled with air and gas, and on every down-stroke it empties its charge alternately to the top and bottom cylinders; and when explosion takes place in the working end of one cylinder, gas and air are delivered into the working end of the other cylinder from the receiver space. Then, on the return stroke, the gas and air so delivered into this cylinder are compressed; while the other cylinder is opened to the exhaust. The supply of air and gas is regulated by the first balanced valve, which may be controlled either by an ordinary centrifugal governor, so as to vary the amount of opening of the ports through which gas and air are admitted, or by a governor which allows them to open fully for a greater or less period of the stroke of the pistons of the working cylinders.

Burners for Gas Stoves and Grills.—Fuller, W. J., of Pimlico, S.W. No. 7284; April 12, 1894.

This invention is designed to automatically turn off the gas supply to a gas stove or grill (independently of the gas-cock), when the cooking utensil being heated is taken off the stove.

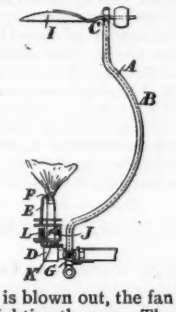
The two ends of the body or socket of the tap arrangement are adapted to be connected to the main gas supply-pipe, in such a manner that the socket practically forms a part of the supply-pipe. B is a chamber formed within the body; the walls being preferably cast in one piece with it. C is the opening into the chamber, in which the pipe for conveying the gas to the burner is fixed; and D is a passage or opening through which the gas passes into the chamber B. A valve-seat is formed around the lower end of the passage. There is a



plug screwed into an opening above the passage D, serving (when removed) to allow the passage to be cleaned, and to afford access to the interior of the chamber. G is a valve, which, when bearing against the seat, shuts off the supply of gas to the chamber B; the stem H of the valve sliding through a nut screwed into the socket, and provided with a downwardly projecting tubular extension. A cup or tube slides upon this tubular extension (screwed on to the lower end of the stem of the valve), serving to contain mercury or other suitable liquid for forming a gas-tight seal around the lower end of the extension. L is a bell-cranked lever, one arm of which is connected to the usual headed rod, arranged adjacent to the burner in such a manner that it will be depressed when the cooking utensil is pushed over the burner. The other arm is adjustably connected to a rod, forming an extension of the valve-stem H, and connected thereto by a lock-nut for preventing the stem from rotating relatively with the mercury cup. O is the counterweight, connected to the lever L, and serving to hold the valve against its seat when no cooking utensil is over the burner.

Automatic Electrical Gas-Lighters.—Jaskey, W. N., and Else, E. S., of Logan, Utah, U.S.A. No. 18,480; Sept. 29, 1894.

This invention consists of an electrical gas-lighter, having one wire from a battery connected to the gas-pipe at the meter, and the other wire A connected to a spark-coil, and running along the fan support B; the wire being insulated, and making a connection with the fan I at C. From the fan, the current runs down the support B, which is insulated from the elbow D; and then through the coil K, electro-magnet L, and coil J, into the magnet E—making a connection with the arm F at the top of the burner holder. When the current runs through the electro-magnet, it causes the arm E to vibrate against the arm F, producing a spark to light the gas. The magnet is fixed to a bar loosely pivoted to the burner holder; and the magnet vibrates in a slot cut in a disc fixed on the burner holder. The support of the arm E is also insulated from the burner holder. The cock G has an insulated bushing breaking the current on the arm. The plug of the cock has a projection extending therefrom, and making the connection with a projection on the arm extending beyond the insulated bushing. By turning the gas on, the projection from the plug of the cock G switches the current on to the projecting arm F on the burner holder, and thus makes a complete current. When the gas is turned off, the current is broken. Directly the gas is lighted, the heat of the flame raises the fan I, breaking the



current at C. If the gas is blown out, the fan falls, making a complete connection at C, and re-lighting the gas. The fan I has a screw weight attached at one end, to regulate the pressure, and to make the fan nearly balance, in order that the flame may raise the fan for breaking the connection.

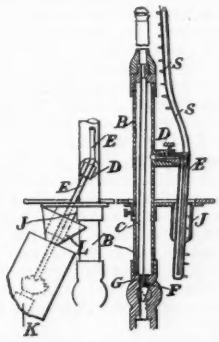
Automatically Lighting Gas.—Duke, J. F., of Newington, S.E. No. 21,032; Nov. 2, 1894.

The patentee claims the use of platinum black mixed with palladium black or spongy palladium (incorporated or not with asbestos or other incombustible material), in such position with respect to a gas-burner that the gas on issuing from it plays upon the mixture in combination with a platinum wire leading from the mixture to near the outlet of the burner, whereby, when the gas begins to play upon the mixture, it raises its temperature sufficiently to render the wire incandescent, so that it ignites the gas.

In carrying out the invention, it is proposed to thoroughly mix together the platinum black and the palladium black or spongy palladium—preferably 9 parts by weight of platinum to 1 part by weight of palladium; and it is best to first form a mixture of the 1 part of palladium with 1 part of platinum, and then to admix this mixture to the other 8 parts of platinum. The mixture can be employed alone; but it is better to incorporate it with some incombustible material—preferably finely teased asbestos, in the proportion of about 3 parts by weight of asbestos to 1 part of the mixture. It is placed in a small cage of platinum gauze (of about 120 meshes to the square inch), so constructed that the air shall have free access to it, especially at the bottom of the cage, or that part opposite to where the gas-flame plays upon it. The inventor finds that covering the mixture with a platinum wire gauze of very fine mesh tends to aid the activity of the mixture by keeping it below the temperature required for consuming the amorphous carbon deposited within its pores. From the mixture in the cage, a fine platinum wire is carried to a position just outside the black line which is always naturally formed by the burning gas at the side of the slit in the burner—that is to say, just where the gas and air mix. This cage is placed in such a position relatively to the burner that the atmospheric air shall play on it, or be drawn through it at the one side, and the gas at the other.

Lighting Gas-Lamps.—Heckert, G., of Munich, Germany. No. 21,079; Nov. 2, 1894.

The object of this invention is to provide means "for permitting the lighting of gas-jets in the interior of lanterns and the like from outside said lanterns, without any door or the like in the latter requiring to be opened."



The device consists of a pipe bent in U form, which, starting inside the lantern at D, beginning from the burner-tube B, bends downwardly, comes out of the lantern through the sleeve J, and then turns up again so as to re-enter the lantern and end on a level with, and in close proximity to, the burner. The upward free arm of the tube is provided with slits S, at suitable distances apart above one another. If now the gas-pipe leading to this tube (and simultaneously that leading to the burner) is opened, and if, by means of the lighter, the gas coming through the lower slits in E outside the lantern is ignited, a running flame will be lit, and the uppermost flame lights the gas issuing from the burner. Thereupon the supply of gas to the tube E is cut off.

It is possible to regulate the gas-feed by the aid of one gas-cock only, in such a manner that the gas is allowed to pass either to the main burner only or to the main burner and pilot burner simultaneously. For this purpose, two passages F and G are arranged within the body of the gas-cock A, of which either one or both can, by having a correspondingly spacious bore to the plug of the cock, be placed in communication with the gas supply-pipe. One of these passages G is, by a pipe C within the pipe B, in connection with the main gas-burner; while the

other passage F communicates by the outer pipe B with the pilot burner. If now the main burner is to be lit, the plug of the cock is turned so that the gas supply communicates with the main burner as well as with the pilot burner. Application of the lighter to the latter burner will cause a running flame on it, whereby the lighting of the main flame is effected. After this is done, the plug is turned so that only the passage G remains in communication with the gas supply-pipe, while the passage F to the burner is closed; and consequently only the main burner continues alight. For extinguishing the lamp, the plug is turned so that both passages F and G are closed.

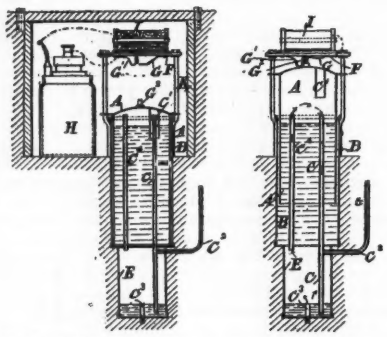
The lighter K, by which the lamps are preferably lit, consists of a lamp such as ordinary lighters have, surrounded by a casing, in the end of which is an orifice with a funnel L, which will allow of its being easily guided and placed on the fuse-tube E when the lamp is to be lit, and which also places itself closely against the lower edge of the socket J, so that the lighting can be effected without difficulty even in wind.

Liquid-Meters.—Goodwin, A., of Sumner Street, S.E. No. 23,572; Dec. 4, 1894.

This invention refers to piston-meters of the type in which the piston of each measuring cylinder controls the action of a slide-valve governing the motion of the piston in another cylinder, and in which the cylinders and other parts are enclosed in a casing forming a chamber, into which the liquid to be measured freely flows, so that the pressure on the inner and outer sides of the cylinders shall be balanced (or nearly so), in order to admit of the use of cylinders of light construction, and so that, by removing one part of the casing, the whole of the working parts of the meter can be inspected or removed for repair, without disconnecting the supply and delivery connections.

Automatically Lighting and Extinguishing Street-Lamps.—White, W., and Wallace, J. A., of Melbourne. No. 412; Jan. 7, 1895.

This method of automatically lighting and extinguishing street and other gas-lamps, consists in utilizing the pressure in the gas-main or other source of supply, for the purpose of actuating apparatus which will open or cut off the supply of gas to the burner, and which will also complete an electrical circuit when the supply is fed to the burner, and thus light the gas.



A is a vertically sliding gasholder or reservoir; and B, a vessel containing water, in which the holder is arranged to rise and fall—the lower end of the holder being open. There is a short downwardly projecting tube C^1, fitted in the underside of the cover or upper part of the holder, and projecting down below the surface of the water in B when the holder is in its lowest position. C is a tube, which projects down from within the tube C^1, above the level of the water, to near the bottom of a draining-vessel E; the gas supply-pipe C^2 leading to the burner being led off from the pipe C at or near the bottom of the containing vessel. C^3 represents the gas supply-pipe, which leads from the main and projects a short distance into the draining-cylinder E, whereby the cylinder is kept supplied with gas. C^4 represents a length of pipe, which leads from the draining-cylinder to above the water-level in the holder outside the short downwardly projecting tube C^1.

F is a fixed frame or platform, carried by suitable supports above the containing vessel B, while G G^1 represent electrical contact springs, provided on the underside of the frame, and arranged to be operated by a pin or projection G^2 on the upper end of the holder. Of these two contact springs, the one marked G^1 is provided with a block having a roughened surface; so that, as the spring G passes over it, the circuit will be made and broken several times from the battery H to the primary winding of an induction coil I. Wires are led from the secondary windings of this induction coil up to the burners of the lamp, where they terminate in points; so that, when the current passes between them, it will form a spark immediately above the top of the burner, and ignite the gas issuing therefrom.

The operation of the invention is as follows: Commencing with the gas at its normal or lowest pressure—that is, before it is turned on at the main to meet the increased evening consumption—the holder A will be down in its lowest position; and the escape of the gas from it will be prevented by the short tube C^1 being sealed beneath the surface of the water in B. The contact springs G G^1 will moreover be out of contact with each other; and thus no current will pass from the battery H through the induction coil I. As soon, however, as the pressure of gas is increased to a certain amount, the holder will rise until the lower end of the tube C^1 is lifted out of the water, when the gas will be free to pass (as indicated by the arrows) up through the pipe C^4, into the holder as before, and thence down through the pipe C and along the pipe C^2 to the lamp burner. By this means, the gas will be turned on.

The lighting is effected as follows: As the holder continues to rise, the projection or pin G^2 will come in contact with the spring G, and will bend it upwards, so as to cause its end to come in contact with the spring G^1—that is, with the roughened surface thereon; the effect being that, as the spring passes over the roughened surface, it will cause contact to be made and broken several times between these two points, and thus an intermittent current will flow through the primary windings of the induction coil I, causing an induction current to pass along the wires to the burner. By this means, the lighting of the gas is effected.

On the pressure in the main being reduced, the reverse action will take place; the holder again falling to its normal position, and thus shutting off the supply of gas and sealing the lower end of the short tube C^1, and thereby closing the end of the pipe C leading through the pipe C^2 to the burner.

The apparatus must be fitted in some position near the lamp. For instance, it can either be fitted inside the lower end of the gas-lamp or placed in a box alongside the gas-lamp in the same way that the meters are now arranged, or it can be fitted in a casing let into the ground close to the lamp-post.

Gas and Compressed-Air Engines.—Lones, A. E., of Prince's End, near Tipton. No. 1046; Jan. 16, 1895.

This invention relates to a combination of gear for operating and governing the air and gas valves of gas-engines, and the inlet-valves of steam-engines and compressed-air engines, by means either of a lever fitted with a sliding-block connected to governors, and acted upon by an adjustable cam on a shaft rotated by chain-gear from the engine crank-shaft; or else by an adjustable cam driven by chain-gear from the engine-shaft, and acting alternately upon slide-blocks connected to governors, and carried by pivoted arms or levers attached to the valves.

APPLICATIONS FOR LETTERS PATENT.

4558.—Ingram, G., "Globular gas-lamps." March 4.
4580.—Kingdon, J. A., "Protecting water-supply pipes from the effects of frost." March 4.
4581.—Prince, F. O'C., "Lighting." March 4.
4590.—Bayer, C., "Rotary gas-engine." March 4.
4670.—Morstein, O. von, "Electric apparatus for igniting and extinguishing gas-jets simultaneously from a distance." March 5.
4743.—Rose, A., "Nozzles for gas-stoves and gas-lights." March 6.
4755.—Redman, F., "Safety gas-tap." March 6.
4786.—Tangyes Limited and Robson, J., jun., "Internal combustion engines." March 6.
4799.—Campbell, J. E., "Manufacture or preparation of materials for the purification of gas, sewage, or the like." March 6.
4825.—Hazlehurst, G. S., "Thawing frozen water-pipes." March 7.
4837.—Ribbans, E. C., "Heating apparatus to be used with oil, gas, or other suitable heating medium." March 7.
4875.—Wenham, W. P., "Pipe-connections." March 7.
4894.—Lake, H. H., "Pipe-couplings." A communication from J. Anderson. March 7.
4904.—Rhodes, G., "Automatic double-acting dead-weight valve for steam, gas, or water." March 8.
4914.—Fletcher, W. F., "Gas-pressure regulators." March 8.
4944.—Stevens, G., "Frost and thaw indicator in water-pipes." March 8.
4948.—Cooper, E. W., "Ignition apparatus and heating burners for gas and vapour engines." March 8.
4964.—Brown, A. C., Neilson, G. R., and Thomas, C. R., "Water-waste preventers." March 8.
4969.—Thompson, W. P., "Pipe-coupling." A communication from A. P. E. Vokác. March 8.
4984.—Arendt, M., "Glasses and devices for incandescence, gas, and petroleum lamps." March 8.
5036.—West, J., "Machinery or apparatus for charging gas retorts." March 9.
5037.—West, J., "Machinery or apparatus for drawing gas-retorts." March 9.
5064.—Bagshawe, B., "Calcium carbide process and product." A communication from T. L. Willson. March 9.

Purchase of the Tiverton Gas-Works by the Corporation.—At a meeting of the Tiverton Town Council last week, it was reported that an agreement had been signed for the purchase of the gas-works from Messrs. Heathcoat and Co., for the sum of £20,000. The deposit agreed upon is to be paid by the 25th inst., or 4 per cent. interest is to be charged upon the amount outstanding.

The Blackrock Commissioners and the Dublin Corporation.—The Blackrock Commissioners believe they have good grounds for making serious complaint against the Vartry water supply of the Dublin Corporation. According to a report presented to them by their Surveyor (Mr. J. T. Kough), blockages were found in the 3 and 4 inch mains in the township, which he attributes partly to accumulations of peaty matter and partly to the corrosion of the pipes. The latter cause, Mr. Kough believes, would be contributed to by the tapping of the mains for house connections, and the cutting out of pipes when bursts occur. He suggests that the Commissioners should lay a new 6-inch main through several parts of the township. New mains to the extent of 30,450 feet would have to be laid; and he estimates the cost at £3500. When the matter was brought before the Commissioners, the Chairman (Mr. J. R. Wigham) confessed that he was a good deal staggered on hearing the report. He was surprised and grieved to find that their boasted Vartry supply was breaking down, and that in consequence of these accumulations, they would have to spend such an enormous sum in relaying the mains. In certain parts of the town, they could not get a sufficient supply of water through the pipes; and this was certainly an unenviable position. He had examined the stuff which had settled in the pipes, and found that it was not rust but dust, and that the application of water converted it into mud; and he therefore came to the conclusion that it was brought into the pipes in the water. If they were going to fight the Corporation, they should let them know that the Vartry water was not as pure as they represented it to be. No doubt it was a very soft water; but it had its defects. The Commissioners decided to have the matter taken from the pipes analyzed.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The South Metropolitan "Workman-Director" Proposal.

SIR,—You will perhaps allow me to deal with a portion of Mr. Livesey's somewhat discursive reply to my letter of Feb. 22, on the "Workman-Director" scheme.

I am sorry Mr. Livesey cannot "see the lion in the path;" but the animal is there nevertheless. He says that my "illustrations entirely miss the kernel of the question," which is "respect for authority," and he illustrates this by the case of the Home Secretary "moving on" at the bidding of an ordinary policeman, and an officer respecting the challenge of the private on sentry duty. He does not seem to perceive that it is not the authority of the policeman or sentry which they acknowledge, but their own authority, and their own administrative orders carried out—but not initiated—by the executive policeman and private soldier. To make perfect his illustration as an analogy to "Workmen-Directors," the policeman would have to sit at the Home Office, from time to time, with the Home Secretary, to frame and revise those regulations; and the private would have to hold an intermittent commission, and sit and vote on Courts Martial.

I say again that such a confusion of functions is a real obstacle to the plan, and not, as Mr. Livesey asserts, "a phantom of my imagination."

Both Mr. Livesey and the writer of your leading article assume that the institution of "Workmen-Directors" is the necessary and natural development of the adoption of profit-sharing. Why? Such an evolution was certainly not foreseen when the system was originally adopted. Mr. Livesey's own *caveat*, which he quotes against "any workman thereby acquiring any right to interfere in the management of the Company," proves that it is an afterthought. What, then, has occurred to make the institution of a separate species of director, with a specially reduced qualifying holding, to represent a separate constituency of shareholders, within the general body? Mr. Livesey agrees with me that it would be mischievous if such directors represented labour *per se;* and that being so, they would, as I said, only represent the interests of the shareholders in general, which interests must be assumed to be identical. Are there to be two sets of shareholders appointing directors for the same object—viz., to direct the general affairs of the undertaking—or are the nominees of one set to deal only with specified questions? The more the scheme is considered, the more anomalous it seems to be.

I cannot understand what Mr. Livesey means by his remark that I "should intensify rather than obliterate the line which separates class from class, and instead of promoting identity of interest, would act in entirely the opposite direction." I recognize no such line of separation between the directors of a company. All directors have, as have Labour Members of Parliament in common with all other members, equal rights, privileges, and responsibilities. There is nothing to prevent the profit-sharing stockholders nominating a director in the ordinary way, and qualifying him out of a common fund, if they so desire it; but such director could not be, and ought not to be, at the same time an employee of the Company, though he might be, or have been, a working man employed elsewhere. In a former leader, you instanced the case of "Workmen-Directors" sitting on municipal gas committees as town or urban councillors; but you did not say, and did not mean to suggest, I think, that these councillors sitting on gas committees were also employees in the gas-works of which the said committees had charge.

That is the *crux* of the scheme—the double and incompatible functions, the "Jekyll and Hyde" sort of existence, which it involves.

Mr. Livesey says I do not understand even the alphabet of profit-sharing, because I cannot assent to sectional representation on the board. Do not the majority of his colleagues, with whom I agree, understand it? Profit-sharing may be—probably is—an excellent system. I neither affirm nor deny that proposition. I await, with interest, the development of the experiment. In itself, I look upon it as a "counsel of perfection," and theoretically desirable as promoting thrift (though compulsory thrift is hardly to be accounted a virtue). But I do not value it as a nostrum against strikes. I should not desire to ward off the disaffection of labour with bribes and bonuses, which, after all, are only increased wages in another form. I would rather that the rate of wages should be governed by the fair and equitable value of the labour performed. But I do not presume to condemn the Board for giving the plan a thorough trial; and if The Gaslight and Coke Company's employees ask for it, I have little doubt but that it would be conceded by the Court of my Company on such a basis as not to make the remuneration received by our workers higher than that paid by other Metropolitan Companies.

Only one more point, and I will close this too lengthy letter. When I wrote of a "false step," I had in my mind not only the rejected clauses, but also the action of the Chairman of the Board, who among his colleagues is only *primus inter pares*, in appealing to his shareholders for an "expression of opinion" on the action of the majority of his colleagues who rejected his plan. He says I am mistaken in saying that he asked the shareholders to endorse the proposition. He had said "the Directors would like an expression of opinion." Does he mean that all the Directors asked the shareholders for an expression of opinion, or only the minority? This "expression of opinion" was formulated; but the resolution was withdrawn at the request of the opponents. If the resolution approved the action of the minority, it was a vote of confidence in those Directors who composed the minority; and therefore a vote of censure on the majority of the Directors. Had the resolution (with proper notice) been pressed and carried, I do not see how the majority could, without loss of self-respect, have continued to hold office; and the converse would have held good in case of its rejection.

We often hear or read of members of a board or a Cabinet resigning office because they cannot accept the policy of the majority of their colleagues, and stating their reasons for their action. But I have never known, till now, a case of a director attempting to get a vote of censure passed on those of his colleagues who have outvoted him on a question of policy; and I cannot help thinking that the Chairman must regret that he made the attempt. Such action is most unconstitutional, and must render harmonious working at the Board very difficult; and it is calculated to impair the efficiency of the governing body. Mr. Livesey has a perfect right to try and convert, by argument, his present minority on the Board on this question into a majority; and that is the proper and usual course to take, though I personally, as a shareholder, hope it will be unsuccessful.

WM. THOS. MAKINS.

1, *Lowther Gardens, Prince's Gate, S.W.*,
March 15, 1895.

Mr. Wright's Society of Chemical Industry Paper.

SIR,—I feel much obliged to Mr. Wright for the attention he has given to my question. His letter, however, appears to attach a somewhat different meaning to his former statement that "they obtained with increased lighting power a corresponding increase in heating power;" for this, as I understand it, is certainly not confirmed by his summary of ratios (*p.* 543). If, with increase in lighting power, there is, *pari passu*, increase in heating power (and such is the construction I give to the phrase employed by Mr. Wright), the ratios under the heading "candle power" and "heating power" should be the same. Differing as they do, they but lend support to my contention that even if the luminosity of lighting gas could be economically increased, it by no means follows that the heating power would be.

Readers of the JOURNAL will no doubt feel grateful to Mr. Wright for the valuable calorimetric data given in his letter—data not readily accessible to all.

CHAS. HUNT

Birmingham, March 16, 1895.

Enrichment and the Light and Heat Efficiencies of Gas.

SIR,—The fact that the light and heat efficiency of gas consumption augments with the increase in the density of the hydrocarbon constituents was graphically demonstrated some years ago in the JOURNAL—in the first instance, in Mr. B. H. Thwaite's articles on "Combustion." But the increase of light and heat efficiency may be more than counterbalanced by the increased cost of the enriching agent. Mr. Wright has perhaps overlooked this.

J. W. VICKERS.

Stamford Hill, March 14, 1895.

Drawing Moneys from Reserve-Funds.

SIR,—I would like to ask an opinion through your columns as to what it is which constitutes an "extraordinary claim or demand" when drawing money from the reserve fund.

A gas company with statutory powers obtained twenty-five years ago, incorporated in the usual way with the Companies' Clauses Act, 1845, and the Gas-Works Clauses Act, 1847, has had occasion to contest this point with two Justices; and it seems to be very debateable ground. Would it be an extraordinary claim or demand within the meaning of the Gas-Works Clauses Act, if a gasholder which is worn out and must be renewed (say) at a cost of £2000, or a set of old-fashioned retort-ovens falling to pieces, must be renewed at a cost of £800 (no depreciation having been written off against them), if these were paid out of the reserve-fund?

The certificate of the Justices is not difficult to obtain if they have proof what it is that constitutes an extraordinary claim or demand; but when or where has this point been defined?

FINANCE.

March 9, 1895.

Shilling Prepayment Meters.—A Suggestion.

SIR,—The success of "penny-in-the-slot" meters is now assured, and nearly every town of importance is adopting them. Seeing what an unqualified success these meters have proved, why not go a step further and introduce a shilling or a two shilling slot-meter? With such a meter, the obnoxious deposit system would become a thing of the past, bad debts would be reduced, disputed accounts would become rare; and, instead of waiting four or five months for their money, gas companies could collect their accounts monthly, and thus greatly reduce their working capital. On the other side, consumers would pay for their gas as they required it; there would be no heavy bill for them to face at the end of the quarter; and they would have a control over their gas consumption such as no other system could give them. To a very numerous class of consumers, shilling slot-meters would prove an unmixed blessing.

H. E. A.

March 13, 1895.

Extensions at the Workington Gas-Works.—At the last meeting of the Workington Town Council, a recommendation of the Gas Committee was adopted to the effect that Messrs. Drake and Sons' tender for their system of setting retorts be accepted, and that application be made to the Local Government Board for a loan of £1500 to carry out the work.

Alleged Leakage of a Reservoir at Millbrook.—At the last two meetings of the St. German's District Council, serious allegations have been made with reference to the new reservoir which has been constructed to supply the village of Millbrook with water. The Sanitary Inspector stated on the last occasion that the reservoir was capable of holding 2½ million gallons of water, but contained only about two-thirds of this quantity; while Mr. Pearn, a member of the Council, said it was only about a quarter full, and the decrease was still going on. A letter was read from the Engineer (Mr. Masterton), in which he said he had asked the Clerk of Works to ascertain the cause of the decrease. The Chairman (Mr. R. E. Paige) said it was anything but satisfactory to find that a reservoir which cost between £5000 and £6000 was in a few months running empty. The Council ought to ask Mr. Masterton to give his personal attention to the matter. A resolution embodying this suggestion, and requesting the Engineer to attend the next meeting of the Council was carried unanimously; Mr Bickford, a member, remarking that the defect was due to the nature of the site selected rather than to bad workmanship.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills committed: Hebden Bridge and Mytholmroyd Gas Board Bill (opposition withdrawn), Rotherham Corporation Bill.

Bill reported, with amendments: Bristol Water Bill.

A petition in favour of the Ilfracombe Gas Bill was presented from owners, lessees, occupiers, inhabitants, and ratepayers of Ilfracombe.

HOUSE OF COMMONS.

Tuesday, March 12.

ANGLO-PORTUGUESE GAS AND WATER COMPANY.

Mr. JOHN AIRD asked the Under-Secretary of State for Foreign Affairs whether he was aware that, in June, 1887, the Anglo-Portuguese Gas and Water Company, Limited, was incorporated to construct gas and water works at Figueira da Foz in Portugal, with a distinct understanding from the town, confirmed by the Portuguese Minister at Lisbon, that the import duty on the material required for the construction of the works would afterwards be remitted, and that the Company then deposited the amount of the duty with the Customs authorities, and constructed the works, involving an outlay of £45,000, under the promise that a Bill would be introduced to return the duty; and whether repeated applications having been made to the Portuguese Government, and also to the British Ambassador at Lisbon, as to the return of the deposit, and without result, Her Majesty's Government would bring the matter before the Portuguese Government.

Sir E. E. GREY replied that the circumstances of the case were substantially as stated in the question. The instructions were sent last January to Her Majesty's Minister at Lisbon to press for immediate satisfaction of the Company's claims; and he had addressed an urgent representation to the Portuguese Government on the subject.

The following progress was made with Bills last week:—

Bills reported: Cranbrook District Water Bill, Newmarket Gas Bill.

Petitions against the Lambeth Water (Transfer) Bill and the Southwark and Vauxhall Water (Transfer) Bill were presented from the Essex County Council, and from the Chelsea, Kent, and New River Water Companies.

The petitions presented by the Cuckfield Urban District Council and the Cuckfield Gas Company, Limited, against the Hayward's Heath Gas Bill were withdrawn.

HOUSE OF LORDS COMMITTEE.

Wednesday, March 13.

(*Before Viscount* HAMPDEN, *Chairman; Lord* TEYNHAM, *Lord* SINCLAIR, *Lord* SEATON, *and Lord* SHUTE.)

AMBLESIDE GAS AND WATER BILL.

This Bill, which provides for the transfer of the undertaking of the Ambleside District Gas and Water Company, Limited, to the Urban District Council, came to-day before a Select Committee constituted as above.

Mr. BALFOUR BROWNE, Q.C., and Mr. J. W. FITZGERALD represented the promoters. The Bill was opposed by the Company, for whom Mr. BIDDER, Q.C., and Mr. RICKARDS appeared. There were also petitions against the Bill by the Corporation of Manchester and the London and North-Western Railway Company; but there were no Counsel in attendance to support them.

Mr. BALFOUR BROWNE, in opening the case, said that the Company owning the gas and water works was not an incorporated, but a limited liability Company, formed in 1866 with a nominal capital of £12,000; and they entered into arrangements and constructed works for the supply of gas and water to what was then a rural district; the Local Board, which had since become the District Council under the Act of last year, not having been formed till 1885. The water had never been supplied outside the Local Board district; but the gas-mains went beyond it. Until a year and a half ago, the supply of gas was sufficient for the district; and as to the water, though the service was ample, the works were inadequate. The reservoir was a very small one, containing only 328,125 gallons, which was sometimes drawn off in a single day; the supply amounting to about 135 gallons per day per head of the population. Finding it necessary to take steps to save leakage and extend their works, and also to spend more money upon the gas undertaking, the Company came last year for an Act proposing to change the status of the concern from that of a limited liability to a statutory Company; but at the same time they expressed over and over again their willingness to sell the undertaking to the Local Board. The Board opposed the Bill on the ground that the authorization of the Company as a statutory Company would enhance the selling value; and while they were willing to purchase, the only dispute was as to the price to be paid. In this respect, he urged, the Company took an exaggerated view of the value of their property; while the Company would no doubt say the Local Board took quite an inadequate view of it. The question had to be decided by somebody; and as they could not ask the Committee to settle the price, they proposed in the Bill that it should be fixed by arbitration. Having described the negotiations which had taken place, the learned Counsel referred to the clauses of the Bill in which it was proposed: "Provided that, for the purpose of any such arbitration, the sale and purchase shall be deemed to be a sale and purchase by agreement, and not by compulsion." Under the circumstances of the Company being, as he maintained, an absolutely willing seller, this was perfectly fair. The Bill was thrown out on a distinct pledge to the Chairman of the Committee that the Local Board would come with a Purchase Bill this year. The object of the clause in question was that nothing should be allowed by the Arbitrator for compulsory sale; it having become the practice of arbitrators to make an allowance of 10 per cent. in this respect, though there was nothing about it in the Lands Clauses Act. It would be a public advantage for the undertaking to come into the hands of the Local Authority; for the Company were at the end of their tether; and in proposing to spend more money last year, they also proposed to raise the price charged for gas and water. The District Council would be able to raise the money required at 3½ per cent.; and it would be for the advantage of the district to have the money for the further improvements raised by them instead of by the Company. The figure at which the Company were willing to sell was £24,000, which, he thought, was enormously exaggerated; but the Council proposed that the Company should sell upon the full and fair value as determined by an independent person, without any addition of 10 per cent. for compulsory sale. Having pointed out that if the Bill were rejected the Council had the power to supply in competition with the Company, he proceeded to comment upon the petition which had been presented by the Company, in which they objected to being deprived of their undertaking, being themselves capable of supplying any extension that was necessary, and urging that the proposed terms of transfer were unfair and unjust.

Mr. *G. Gatey*, the Clerk to the Council, gave evidence as to the negotiations which had taken place between that body and the Company with regard to the projected sale, in which the latter asked £24,020, while the Council, acting upon a valuation made by Mr. Silverthorne, offered only £14,002, which the Company said was manifestly so much below the value that they could not treat the proposal as a serious step towards the arrangement of terms by agreement.

In cross-examination, witness said the district had no fault to find with the Company's supply, nor with the way in which they had carried on their business. If the Council had the water undertaking, they would get water for flushing purposes; but this would mean a saving of less than £4 a year. They would also get water for the roads, and would save friction in regard to breaking them up. Questioned with regard to the proviso to the arbitration clause, he said he was aware that the Model Bill adopted by the authorities of the House provided that the price fixed, in default of agreement, by arbitration should be under the provisions of the Lands Clauses Act; but the Model Bill, like every other case, was altered to suit circumstances.

Mr. *Hugh Redmayne*, a surgeon at Ambleside, and Chairman of the District Council, also gave evidence in support of the Bill. He stated that the conclusion at which the Local Board had arrived was that it would be advantageous to the town to become possessed of the gas and water supply. The price at present charged to small consumers of gas was 5s. 8d. per 1000 cubic feet; and in the Bill it was proposed that the maximum should be 5s. 6d. The charges for water were on the gross rental; but the Bill proposed that the charge should be 5 per cent. on the rateable value, with water-closets and a bath free.

In cross-examination by Mr. BIDDER, witness agreed that the Company had done their work well, and had given satisfaction to the district. The charge for gas was graduated—5s. 8d. being the maximum: and as the prices were subject to 5 per cent. discount if paid within a month, this reduced it to about 5s. 5d. He was responsible, with the rest of his colleagues, for proposing to ask Parliament to say that the Company should sell their undertaking on arbitration terms, and that it was to be deemed a sale and purchase by agreement and not by compulsion.

Mr. *R. P. Hunter*, a member of the District Council, supported the Bill, and laid special stress upon the advantage of having only one authority to break up the roads, as an accident had occurred by imperfectly making up the trenches when the Company laid down the mains to Low Wood. He stated that there was a deficiency of pressure of water both in the higher and lower districts, which, in case of fire, would be a serious matter.

In cross-examination by Mr. BIDDER, witness admitted that the Company had put in a new main to supply the district in which the deficiency was complained of, and that there had since been no reason for complaint.

Mr. *A. Silverthorne*, Assoc.M.Inst.C.E., said he had been engaged in the valuation of gas-works for the purpose of sale and transfer, and had been arbitrator in such cases. He had inspected the works of the Company, and valued them at £14,105. He advised the Local Board that they could not pay the sum of £24,020 which the Company asked for them without incurring very great liability. He advised opposition to the Company's Bill last year, which unquestionably would have at once enhanced by five years' purchase the value of the undertaking, without any advantage to the buyers, merely by the fact of their having a statutory status. Having criticized the details of the Bill promoted by the Company, he said that in regard to the water supply there was enormous waste, which the Company had tolerated for many years, and which was phenomenal. On investigating the matter, he found that practically there were 51 gallons per head per day being consumed; and at night, 57 gallons per head actually disappeared. This was a state of things which existed nowhere else, and ought not to be allowed to exist. The Company had no power to remedy this state of things, as it could only be done by obtaining an Act of Parliament enabling them to make regulations. If the works passed into the hands of the Local Authority, it would be compulsory upon them to at once try to prevent this enormous waste. The capacity of the gas-works was exhausted; and, for the purposes of extension, the Local Authority would raise the money cheaper than the Company. He attached great importance to the arbitration taking place under the Public Health Act rather than under the Lands Clauses Act, as the procedure was less expensive; and in the circumstances of the Company having offered their works for sale——

Mr. BIDDER: No; I beg your pardon.

Witness said this was what he understood; and negotiations having taken place with the Local Board for the purchase, he could not regard it as a compulsory sale. He valued the undertaking upon the basis of its maintainable profits, which were less in the case of a non-statutory company than in that of a statutory one. By the adoption of the Bill, three essential things would be secured—viz., the stoppage of waste of water, the reduction of the price of gas, and the introduction

of the principle of the redemption of capital. The terms proposed in the Bill he considered fair and reasonable. The leakage of gas amounted to 13 per cent., which was high, as he was more accustomed to 5 or 6 than 13 per cent. No doubt, the mains were not in very good repair.

Mr. BIDDER, in cross-examination, put to the witness a report on the works in which he had said that the rate of leakage was the same as was found in works of this class, and did not suggest that the mains were in a defective condition. Witness explained that the reason of the leakage being high was purely because renewals of mains were not made in small places in the way they were carried out in large ones. As to the waste of water, the Company had an abundant supply; still he considered the waste of water in a town was a most serious objection and attended with grave inconveniences. The small service reservoir would, under some conditions, be emptied more rapidly; and this would actually prejudice and impair the service of the hydrants, which in the middle of summer would be objectionable and dangerous. He did not pose as a construction engineer at all, and had only had the management of gas-works abroad. If the Company had been absolute owners of the property, he would have valued the undertaking at £16,000; but they would cease to be lessees of the water-works in 84 years. The portion of the property which they could dispose of, he valued at 13 years' purchase; and he advised the Local Board to give the Company a bonus of £1000 in lieu of compulsory purchase. He thought the proviso in the arbitration clause might be dispensed with.

Mr. *W. A. Valon*, Assoc.M.Inst.C.E., said he had examined the Company's works, and considered that the reservoir capacity was too small, and that the excessive supply of 135 gallons, a great deal of which ran to waste, was objectionable. As to the gas-works, except that they had a few retorts beyond their requirements, they were run out in every direction, and money must be expended to keep up the present supply, without regard to any future extensions. He had made a structural valuation of the works; but he was not asked by Counsel to state what it was. The price ought to be arrived at by an Arbitrator, who, in giving his decision, should have regard to every circumstance surrounding the case; and if the Company received the full value of their undertaking, he did not think they should ask for anything else. He agreed generally that it was desirable that water-works should be in the hands of local authorities, and did not think there was anything unfair in the proposals of the Bill relating to the transfer.

In cross-examination by Mr. BIDDER, witness expressed his preference for arbitration under the Public Health Act rather than under the Lands Clauses Act, as it would save the District Council being saddled with heavy expenses. He thought the Company had been unreasonable in refusing to go to arbitration, especially as their existence depended upon the good-will of the people who wanted to purchase them, and who had in the past made the whole value of the undertaking. Another holder was required, which would cost £2000.

This being the whole of the evidence put forward,

Mr. BIDDER addressed the Committee on behalf of the Company; urging that the promoters must show something more than the mere wish to acquire the undertaking. They must show that there was some distinct and real public advantage in the powers asked for, and in exercising compulsory powers over the Company's property. He maintained that no such case had been made out; the Company having carried on their business with the approval of the people in the district. He especially objected to the proviso in the arbitration clause, which he said had shocked even so serious an expert as Mr. Silverthorne; and he asked the Committee to reject the Bill.

After a private consultation,

The CHAIRMAN said that the Committee had decided that, having regard to the action of Parliament last year, and on the grounds of public policy, there should be a transference of the property from the Company to the District Council, but subject to the substitution for clause 6 of a clause enacting that the arbitration should be under the Lands Clauses Act, and also that the question of the position of the salaried officials and the costs of winding up should be left to the Arbitrator.

Mr. BIDDER: And without the proposed proviso.

The CHAIRMAN: And without the proviso.

Mr. BIDDER called attention to the fact that power was given in the Bill for the Local Authority to supply gas and water themselves. Of course, they must not be in a position, when they went before the Arbitrator, to say: "Now we have power to supply, therefore your undertaking is depreciated in value."

Mr. BALFOUR BROWNE said it was in the Bill already.

Mr. BIDDER said he was quite content, and would take his friend's assurance that this point would not be urged.

The proceedings were then adjourned till the following day, when the clauses of the Bill were brought up and agreed to; and the Chairman was directed to report the Bill, as amended, to the House.

HOUSE OF COMMONS COMMITTEE.

Monday, March 11.

(*Before Sir* J. KITSON, *Chairman; Viscount* CRANBORNE, *Mr.* WROUGHTON, *and Mr.* S. H. WHITBREAD.)

NORTH MIDDLESEX GAS BILL.

This Bill, by which the North Middlesex Gas Company seek to be dissolved and reincorporated with additional powers and further capital, came before the Committee to-day.

Mr. LITTLER, Q.C., Mr. BOXELL, Q.C., and Mr. C. BAGGALLAY appeared for the promoters of the Bill. The petitioners against it were the Finchley Urban District Council, represented by Mr. CASTLE, Q.C.; the Hendon Urban District Council, by Mr. CRIPPS, Q.C., Mr. G. W. GARRETT, and Mr. J. P. OLIVER; and Mr. T. N. Allen, by Mr. PEMBROKE STEPHENS, Q.C.

Mr. LITTLER, in opening the case, explained that the promoters already possessed parliamentary powers. The Company was originally constituted in 1862, when the Finchley and Hendon district was very different from what it was to-day; it was, indeed, at that time quite a rural district. As the neighbourhood grew in population, and the demands on the Company increased, the Directors felt it necessary to get parliamentary status and powers. Consequently, they obtained in 1871 an Act containing the usual provisions applicable to gas companies at that period in regard alike to powers, privileges, and disabilities; and they were empowered to raise share capital to the extent of £15,000, which was entitled to pay, when it could, 10 per cent. dividend. In 1876, authority was obtained to raise £30,000 of additional capital; the usual conditions being imposed—viz., that the original capital should continue to bear 10 per cent., whereas on the new capital the maximum interest should be 7 per cent. on the ordinary, and 6 per cent. on the preference shares. In addition to raising the £45,000 of capital authorized by the Acts of 1871 and 1876, the Company had borrowed the whole amount they were empowered to raise by loan—viz., £11,750—on mortgage at 5 per cent. interest. Between 1876 and the present time, the district had so grown that the Company now felt it to be absolutely necessary that something should be done in the way of getting additional capital. Hence the present application, in connection with which it had been thought desirable to consolidate in the Bill all the powers comprised in the former Acts of Parliament. It was proposed to increase the total capital to £100,000, by the creation of £55,000 worth of new ordinary and preference shares, which, in accordance with the modern practice, would have to be offered for sale by auction. In order further to ensure the cautious issuing of stock, it was provided that not more than £8000 should be raised in the first year, nor more than £6000 in any subsequent year. As to the purposes to which the new capital was to be applied, it was absolutely wanted for the further development of the Company's works in order to meet the growing demands of the district. The maximum rates of interest on the existing capital would not be interfered with; while as to the additional £55,000 to be raised, the interest payable on the ordinary shares would be limited to 7 per cent., and on the preference shares to 6 per cent. Provision was also made for a 5 per cent. reserve fund. The price at present charged for gas was 4s. 3d. per 1000 cubic feet, and the maximum asked for in the Bill was 4s. 9d.; thus securing a not unreasonable margin of 6d. to meet the possible emergencies of strikes, explosions, &c. The necessity for such a margin was shown by the fact that a neighbouring Company some years ago had to go to Parliament for a Special Act, at considerable cost, to enable them to raise their maximum price to 6s. per 1000 cubic feet, in order to meet the losses occasioned by an explosion. The Bill provided, in accordance with the general practice, that there should be a pressure of 6-10ths of an inch from midnight to sunrise, and 8-10ths from sunset to midnight. As to illuminating power, it was proposed to fix it at 14 candles. He knew that it had been the recent practice of Parliament to insist on 15 candles; but he contended that, in view of the introduction of incandescent burners, and of the fact that in the Company's district the gas was largely used for culinary purposes, 14-candle power was sufficient, especially as a higher standard would necessitate increased cost of production to be borne by the consumer, who would not get any adequate return. The learned Counsel concluded by reviewing the petitions against the Bill, which he contended were unreasonable, except in so far as the promoters were prepared to meet them by fair amendments.

The following witnesses were then called:—

Mr. *J. Cash*, M.Inst.C.E., examined by Mr. BOXELL, said he had been Engineer and Manager of the Brighton and Hove General Gas Company for the last nine years; and he had been the Consulting Engineer of the North Middlesex Gas Company for 35 years. The whole of the original capital of the Company and that authorized by the Acts of 1871 and 1876 had been issued; in fact, when payment for work now in hand had been made, the capital account would be overdrawn. He believed the money had been judiciously employed. Considering the extent of the business, it was a moderate capital. The district of supply, comprising Finchley and Hendon, was for a number of years almost at a standstill in regard to the demand for gas; but recently there had been considerable signs of increase. The quantity of gas supplied by the Company in 1889 was 45,562,000 cubic feet; in 1890, 47,799,000 cubic feet; and in 1893, 54,368,000 cubic feet. More of the land in the district was now being built upon; in short, they were getting the natural overflow from the surrounding neighbourhoods served by the Hornsey, Colney Hatch, and Tottenham Companies. He anticipated that the rate of increase in the future would be greater than it had been in the past; and that, in consequence, the whole of the additional capital now asked for would be soon exhausted—certainly in 15 years. The site of the present works, consisting of only 3 acres, was already fully occupied, and left no room for the additions necessary to the manufacturing and purifying plant. They had made a provisional agreement for the acquisition of 6½ acres immediately adjoining the present site; and they asked for compulsory powers to take an additional 5 acres of land belonging to the petitioner, Mr. Allen. These additional lands were necessary for the required enlargement of the works. A more cramped area would necessitate a concentration of works that would involve greater expense, besides creating an actual nuisance. The new capital applied for was moderate in amount. The Company were already putting up a new gasholder; and by the time they had paid for it and met other expenses, they would have overdrawn their capital account by some £500 or £600. In the very near future, a large increase in the productive and purifying plant of the Company would be absolutely necessary. They were at present working almost within the limit of danger. The purifying plant would require to be entirely reconstructed. The maximum price of 4s. 9d. which it was proposed to charge for gas supplied was, in his opinion, fair. It only gave them a margin of 6d. beyond what they were at present actually charging; and it was necessary to have such a margin to provide against exceptional demands that might come upon them in connection with coal difficulties, labour, and other matters. At present, the Company were working with really a larger margin than that asked for in the Bill, inasmuch as they were charging only 4s. 3d., while the maximum granted by the Act of 1871 was 5s. The prices charged to consumers had been: In 1885, 5s.; in 1886, 4s. 9d.; in 1887, 4s. 6d.; and in 1888, 4s. 3d. At this price it had remained ever since. The profits earned had been: In 1886, £4716; in 1887, £3990; in 1888, £4087; in 1889, £3692; in 1890, £3965; in 1891, £3905; in 1892, £3863; in 1893, £4088.

Mr. BOXELL: From these figures, it would appear that you could not have made a further reduction in price after 1888?

Witness: No. We had made all the reductions we possibly could; and you will see that there has been a steady decrease of our profits in consequence.

Were the profits earned always equal to the authorized dividends?—No. On some occasions, the profit earned was not sufficient to provide for those dividends; and the Company's reserve fund has not yet reached the authorized amount.

The allegations of the petitioners against the Bill were next gone into. In regard to Mr. Allen's petition, witness said that the land scheduled belonging to that gentleman was admirably suited for the requirements of the works, especially for the purpose of securing adequate means of access to the public highway; and that the rest of his estate would be in no way prejudiced. The Company did not propose in any way by the Bill to enlarge their area of supply. In regard to the Hendon Local Board's petition, he ridiculed the comparison that was attempted to be set up between the price charged by the Company and that of The Gaslight and Coke Company. It was utterly absurd. The latter Company sold in twelve hours as much gas as the little concern he represented made in a whole year. They could not therefore be spoken of in the same breath. With regard to illuminating power, he admitted that the recent practice had been to require 15 candles; but he was convinced that, from the consumer's point of view, this was a mistake. As to illumination, the consumer, by using a little more gas, could get practically what candle power he liked; while for heating and cooking purposes, the lower quality of gas was very much cheaper when they considered that every additional candle power necessitated an increased price of 2d. per 1000 cubic feet. He had had some experience in connection with the matter at Brighton, where they had been compelled to raise the illuminating power from 14 to 15 candles. He had been unable to find any consumers who had discovered an appreciable difference in the quality of the lighting, though they did notice and complain of the consequent increase in price. The North Middlesex Company, while at present compelled to supply 14-candle gas, did, as a matter of fact, supply it of higher power as a precaution against incurring penalties. He had not heard of any complaints from consumers as to the quality or quantity of the gas. The suggestion of the Finchley District Council, that all mains should be laid at least 3 feet below the surface, was absurd, as it would be inconvenient in many cases and unnecessarily costly.

Mr. CASTLE cross-examined the witness at some length, and asked whether the area of supply of The Gaslight and Coke Company did not adjoin that of the North Middlesex Company, and would not naturally have absorbed it if the latter had not existed. Witness admitted that this might have been the case; but he said the circumstances of the two areas were so different, that The Gaslight and Coke Company could never have made it pay to supply Finchley and Hendon at the price they were charging. He reckoned the capital outlay of the North Middlesex Company at £800 per million cubic feet, which he admitted was more than in the case of companies doing a larger business under more favourable circumstances. In his opinion, the reserve fund system, with a maximum price, as proposed in the Bill, was more favourable to the consumer than the sliding-scale system.

After a few questions from Mr. PEMBROKE STEPHENS in regard to the case of Mr. Allen's land,

Mr. CRIPPS cross-examined witness on behalf of the Hendon District Council. He admitted that the percentage of leakage in the Company's district—12 or 13 per cent.—was much higher than the average. If it could be reduced, it would be a saving; but the steps necessary to reduce it, owing to the nature of the district, would cost more than would be saved. It was not usual to require debentures to be subject, like new shares, to the auction clauses; but, personally, he saw no objection to it.

Mr. LITTLER briefly re-examined the witness.

Tuesday, March 12.

Mr. *E. H. Stevenson*, M.Inst.C.E., examined by Mr. BAGGALLAY, said he had read the Bill and the petitions against it. He had also visited the works and the district, and had been for a long time acquainted with the latter. The works were well situated for the service of the district; but the approach, being only by a narrow occupation road, was very unsatisfactory. The site of the works was at present fully occupied; and they could not economically increase the output from the present site. The existing plant and works were inadequate. Some portions required enlargement, and others rebuilding.

Mr. BAGGALLAY: Is that a necessity which will soon come about, or is it immediate?

Witness: It is immediate. The Company must enlarge their works or the district will suffer, and, in another year or two, will be in darkness during the winter months.

In regard to capital, is the capital of the Company at the present moment, in your opinion, high or low in proportion to the output?—I consider it somewhat high; but there are many reasons why it should be above the average, such as the works having grown rapidly from very small beginnings, the great length of mains in proportion to the consumption of gas, and the necessity of large-sized mains, owing to the extensive district of supply. Having regard to these and other circumstances, the capital is not extraordinarily high; but it is somewhat higher than I should like to see it.

Witness, in answer to further questions, said the works were originally built on a scale which soon proved insufficient for the demand; so that there had to be a certain amount of rebuilding. Similar causes had led to other companies in the Metropolis having a considerably larger capital than the average. He had considered the question of increased consumption in the North Middlesex Company's district; and he had come to the conclusion that, for the next twelve or fifteen years, the increase would, in all probability, be at the rate of 7 per cent. per annum. Assuming this estimate to be correct, the additional capital asked for was no more than a reasonable and proper provision. The land proposed to be taken for the enlargement of the works was in every way suitable, and would have the advantage of providing the Company with adequate access to the public road and an independent way for their mains, instead of the latter having to be carried, as now, under the railway. He did not think the quantity of land asked for was unreasonable. If works were cramped, it added to the difficulty of manufacture. The Company proposed to manufacture and store gas only on the 6 acres they were taking under their provisional agreement. As to the additional 5 acres which they sought power to compulsorily purchase from Mr. Allen, it was not intended to use that land for the purpose of manufacturing or storing gas. He presumed it would be used for putting up cottages for the workpeople, and for the storing of pipes, meters, &c. Moreover, it was desirable for gas companies to have land in reserve, so that, in case of a sudden requirement, they should not be cornered. As to the price of gas, the Company were only able to pay their way at the present 4s. 3d. rate; and therefore a maximum of 4s. 9d.—giving them a margin of only 6d.—would be reasonable and moderate, especially in view of the tendency of the price of coal, labour, and materials to rise. It had been the invariable practice of Parliament to fix a maximum above the figure charged, unless it was proved that the company had been charging unreasonably, or anything of that kind. As to the illuminating power of the gas, he thought that, under existing conditions, 14-candle gas was sufficient, and was best in the interests of consumers, especially those who used it for cooking and heating purposes. He approved of the proposal for an insurance fund, and said that in 1892 Parliament, in the Ormskirk case, sanctioned the principle of a maximum price with an insurance fund.

Witness having been cross-examined by Mr. PEMBROKE STEPHENS and Mr. CASTLE,

The CHAIRMAN, referring to some questions put by Mr. Castle, intimated that the Committee were quite satisfied that some additional works were necessary; but, of course, it was open for the learned Counsel to show that the Company were asking far too much.

In answer to the CHAIRMAN, witness said that, except in the case of the great Metropolitan Gas Companies, who were required to give a pressure of 1-inch, the pressure generally provided for was that proposed in the Bill—8-10ths of an inch between sunset and midnight, and 6-10ths between midnight and sunset. Of course, in practice, this minimum was always exceeded.

Mr. LITTLER put in a table, showing that the standard of illuminating power was 14 candles in several companies of similar character to the North Middlesex, all of which companies had as high or a higher maximum price.

Witness gave some additional evidence upon this table; and, in cross-examination by Mr. CRIPPS, he admitted that, in the case of Harrow, the illuminating standard had, by an Act passed last year, been raised to 15 candles.

In answer to Mr. LITTLER, witness said that, in his experience, companies with a sliding scale did generally, from considerations of their own interest, reduce the price of gas to consumers as fast as possible.

Mr. LITTLER: You do not think it would be right to have a standard price; but, if you are compelled by Parliament against the will of the Company to have a standard price, what do you think would be a proper figure in the case of this Company?

Witness: I should say 4s. 6d. The price now charged is 4s. 3d.; and it is usual for Parliament to grant something in excess of the price actually charged.

Cross-examined by Mr. CRIPPS, witness maintained that the usual practice of Parliament, in compelling the adoption of a sliding-scale, was to grant a standard price in excess of the price actually being charged. He admitted that, in the Southend case two years ago (in which the Company had had a maximum price, and was placed under the sliding scale), there was a contest as to what, in connection with the sliding scale, the standard price should be. He did not remember the result; but he thought a standard price of 4s. 7d. was substituted for a maximum of 4s. 5d. In other cases, like that of the Tottenham and Edmonton Gas Company, standard prices might have been fixed at a lower figure than the old maximum; but that might have been the result of agreement.

Mr. CRIPPS asked how it could affect the principle of the thing whether the terms were made by agreement or by the Parliamentary Committee.

Witness replied that, in making arrangements, parties often, in order to avoid a fight, gave points away which, in the event of a contest, no Committee would impose upon them.

Mr. LITTLER: Do you think it would be right to reduce by compulsion the prices of a Company who at present are only earning that to which they have a right.

Witness: In my opinion, it would be unreasonable, and would, in a sense, be confiscating the property of the shareholders. Taking the price of 4s. 3d. as it now exists, I would ask for 4s. 9d. as a maximum, or, in the event of the sliding scale being adopted, for 4s. 6d. as a standard price.

Which would you advise the consumers to take?—The maximum. I think they would get more from it.

Mr. CASTLE: I suppose the consumers themselves are the best judges of what they want.

Mr. LITTLER: No; they are generally the worst.

In reply to Viscount CRANBORNE, witness said he did not think an insurance fund in itself would be adequate to meet all contingencies without the margin he had suggested.

Mr. *E. H. Eason*, a land agent, having given evidence in regard to the land proposed to be taken for the purposes of the Bill,

Mr. CRIPPS addressed the Committee on behalf of the Hendon District Council. He observed that the question at issue was not one of sentiment, but of business and figures. The first point was the amount of new capital. The promoters asked for £55,000, *plus* borrowing powers on the bases that the demand for gas would increase at the rate of from 7 to 10 per cent. per annum, and that the expenditure on the increased output of gas would be at the rate of from £700 to £800 per million cubic feet. His clients, on the contrary, who desired to protect impartially the interests of the Company and the consumers, looked to the probable future increase in demand as not likely to exceed 5 per cent. per annum, and estimated the expenditure on future extensions as, at an outside figure, £500 per million cubic feet. The net

difference between the promoters and opponents of the Bill as to the amount of new capital required was between the figures of £55,000 and £27,500. It would be for the Committee, after hearing the evidence on both sides, to decide that issue. The next point was as to the maximum or standard price. His contention was that, under the old system of a maximum price, the consumers obtained no advantage whatever from the existence of that maximum; whereas, by a sliding-scale, with a standard price, shareholders and consumers alike benefited, thanks to the incentive to economical management which was given to the directors by that system. As to what should be the maximum or standard price, that was a question to be settled in each case by an examination of all the circumstances; and what he would suggest, and endeavour to prove by evidence, was that in this case the sliding-scale was the right principle to adopt, and that 4s. would be a proper—and to the Company even a generous—standard price. Another point he desired to insist upon was that the auction clauses should be made to extend to debenture as well as share capital. The principle that was acknowledged to be good in the one case must be good in the other; and if it were adopted, there would be no room left for any suggestion that the debentures had not been placed on the market on the best possible terms. Coming to the question of the illuminating power, he maintained that Hendon wanted gas for lighting purposes as well as for cooking and heating; and that it had a right to insist on the same 15-candle standard as was now generally required, and which was, in fact, imposed by the Board of Trade on every gas company that applied for a Provisional Order. Finally, he defended the demand made by his clients that a clause enabling them to purchase should be inserted in the Bill, contending that such a demand was reasonable in itself, and in strict accordance with the spirit of modern legislation.

Wednesday, March 13.

Mr. *Tilley*, the Assistant Clerk of the Hendon Urban District Council, stated that that body was not antagonistic to the Gas Company; but both the Council and the Ratepayers' Association, and, he believed, the consumers generally were practically unanimous in seeking the terms asked for in the Council's petition.

In answer to Mr. LITTLER, witness said he thought the great advantage of a sliding-scale was that the consumers would benefit as much as the Company by increased profits. The objection to the system of a maximum price was the cost and difficulty of enforcing any reduction of price under the Gas-Works Clauses Act.

Viscount CRANBORNE: Is there any intention on the part of the Council to take over the Company's works, or is that power asked for merely as a weapon to be held over the Company.

Witness: We desire to work harmoniously with the Company. But there is a strong feeling that we ought to have the power to purchase; and there is a very sincere desire to exercise that power if Parliament gives it us.

Mr. CRIPPS said that would conclude his case, as his only other witness, Mr. Woodall, was also a witness for the Finchley District Council, and would be called by the latter.

Mr. CASTLE, for the Finchley Council, intimated that he would call his witnesses before addressing the Committee.

Mr. *Frederick Goodyear*, the Chairman of the Finchley Urban District Council, who had lived in the district 45 years, gave evidence as to the unanimity of the local feeling in support of the opposition to the Bill in its present form. His opinion was that there was a general feeling that the price of the gas was too high, and the quality not good enough.

Mr. LITTLER: I am afraid that is the opinion everywhere in regard to gas companies.

Mr. CASTLE: What about purchase?

Witness: The Council certainly are of opinion that it is very desirable they should have the power, in conjunction with Hendon, of purchasing the gas-works within a reasonable limit of time, and on fair conditions.

Mr. LITTLER: If you bought the Company's works, you could not supply the whole of your parish. Is not your parish supplied partly by The Gaslight and Coke Company, partly by the Barnet Gas and Water Company, and partly by the Colney Hatch Gas Company? Do you propose to buy them all up?

Witness: I confine myself to the matter that is before us.

Mr. LITTLER: Which means that you do not propose to buy them up. You certainly would not like to buy up The Gaslight and Coke Company.

Mr. CASTLE pointed out that all the petitioners proposed was that there should be a Joint Board for purchase. Of course, if the two parishes could not agree, there would be no Joint Board, and therefore no purchase.

Mr. LITTLER: My learned friend, in his frankness, has "given himself away," because there is no Joint Board; and you cannot have one without the intervention of Parliament.

Mr. *Henry Melluish* said he had kept the Queen's Head Hotel, Finchley, for the last twelve years, during which period he had been a consumer of gas provided by the Company. He had had great reason to complain both of the price and quality of the gas; and had consequently in a great measure found it desirable to substitute oil-lamps, as giving better light, and being cheaper. Two years ago, he had new gas-fittings put in throughout his house; but the dissatisfaction continued, especially in regard to the billiard-room.

Mr. LITTLER: Do you not know that every well-appointed billiard-room should be fitted either with Cromartie or incandescent burners? Do you not know that the incandescent burner saves one-third of the gas?

Witness: I know they say so; but I have not tried it.

Mr. *Corbet Woodall*, examined by Mr. CASTLE, stated that he had visited the Hendon and Finchley district specially in connection with this inquiry. He considered that the capital asked for was in excess of the needs of the Company. The present capital was £56,250. On such an amount of capital, they were selling 54,500,000 cubic feet of gas annually. That came to £978 per million feet, which was a large sum. In future, they would not need anything like such an expenditure for the increased consumption. The additional capital (including borrowing powers) now asked for was £68,750. This was more than could be required to carry on the business for twelve or fourteen years, at the end of which period, if fresh capital was wanted, Parliament ought to be again applied to. Such a limitation would be all the more necessary if the Bill was passed without the introduction of the sliding-scale. He considered that £500 per million cubic feet was absolutely sufficient capital to allow for all new business. If the Company continued to increase at the same rate as in the past—viz., about 5 per cent. per annum, they would double their business in fourteen years. Therefore, taking the same quantity of gas as they now sold—54,500,000 cubic feet—and multiplying by the £500 per million, they arrived at the sum of £27,250, which, in his opinion, was sufficient capital for the purpose. He was aware that Mr. Cash and Mr. Stevenson had calculated on an increased annual consumption of from 7 to 10 per cent.; but seeing that the average increase for the last ten years had been only 4·56 per cent., he saw no reason to anticipate that in future it would be more than 5 per cent. He had made inquiry as to the capital expended on new business by all the Companies in the county of Surrey; and the average turned out to be about £300 per million. As to illuminating power, he thought 15 candles should be supplied. When the 14-candle standard was prevalent some twenty years ago, the burner used for testing purposes was very inferior to that now employed; so that a 14-candle standard now would be equivalent to only 12½ candles taken on the basis of twenty years ago.

The CHAIRMAN: I may mention at this point that I have received an intimation that the Chairman of Committees sitting on Unopposed Bills has decided that 15 candles shall be inserted as the illuminating standard in all unopposed Gas Bills. I do not think it necessary, therefore, that the examination on this point should be pursued.

Mr. LITTLER: I am afraid, if that is to be taken as settling the matter, the only result will be that we shall have to ask for an addition of 2d. per 1000 cubic feet to the maximum price. Of course, we shall have to abide by the decision of the Committee upon that point; but I shall urge that we ought to have the extra 2d.

Mr. *Woodall*, continuing his evidence, said the minimum pressure specified in the Bill was the same as had been ordinarily provided in recent Acts of Parliament; but he thought the petitioners were justified in asking that it should be raised. The quantity of gas used now in the daytime for purposes other than lighting was very large; and it was increasing from month to month. A pressure of 6-10ths of an inch therefore did not suffice.

Mr. CASTLE: In regard to price, why do you prefer a sliding-scale?

Witness: I think we can point now to the experience of a very large number of companies who have adopted, or been put under, the sliding-scale system; and in nearly all—in fact, I do not know of an exception—the result has been satisfactory, because, on the one hand, the price of gas has been reduced, and, on the other, the dividends of the company have been increased. The idea of the sliding-scale is to bring the interests of consumers and shareholders into harmony; and it appears to me to do it very thoroughly. It seems to me in this case that the capital would have been more carefully spent if a sliding-scale had been operative. It is the strongest incentive to the practice of economy.

Might it have the effect of letting the works run down?—Such a course would bring its own Nemesis, as it were; because, if the property was allowed to run down in one year, it must be made up for in the future. But the real answer to the question is that we have now a great many companies working under the sliding-scale; and I do not know of one that has resulted in that way. The operation of the sliding-scale so far has been invariably to raise dividends. If the sliding-scale is introduced into this Bill, I think 4s. per 1000 cubic feet would be a fair standard price.

In answer to Mr. LITTLER, witness said he wished to make no charge of negligence in point of economy against the directors of companies which had maximum prices.

Mr. LITTLER: Do they not strive their best to keep down expenditure?

Witness: Yes; and yet there is a better "best" that is brought out by the sliding-scale.

I do not understand that, unless you impute to the directors or managers that they are negligent of their duties. Do they not all try to keep expenses to a minimum?—I think there is a margin of effort that is brought out by the inducement of the larger dividends offered by the sliding-scale.

Is it not the fact that numbers of the old companies, on the 10 and 7 per cent. maximum principle are admirably managed, and have reduced their expenses as much as those on a sliding-scale?—I should think not.

I put it to the Committee that the sliding-scale does not make the slightest difference in administration. Can you name any company which is an exception?—I do not say that I cannot; but I do not. I am a Director of a Company working under the old arrangement; and I am a Director of another Company under a sliding-scale. I am certain I do my best with both; and I do not believe that I am an exception. Yet, having regard to the whole *personnel* of the establishment (directors, officers, and everybody together), I am satisfied the existence of a sliding-scale has a substantial effect.

In answer to further questions, witness stated that if there was a sliding-scale in the Bill, he would not attach so much importance to restricting the amount of capital. Otherwise, even assuming the auction clauses to be in, there were reasons—apart from the question of capital itself—why more should not be given the Company than would suffice for ten or twelve years. As to the question of standard price, in the event of the Committee deciding to impose a sliding-scale, there was at least one precedent for fixing the standard price below the price that had been actually charged. He alluded to the case of Tottenham, where the charge had been 4s. per 1000 cubic feet; but the standard price was fixed at 3s. 8d.

Mr. LITTLER: But that was by agreement. It was not imposed on the Company by a Committee.

Other witnesses having been examined,

Mr. PEMBROKE STEPHENS was heard on behalf of Mr. T. N. Allen, who objected to the Bill being passed without some provision being inserted for his special compensation, in respect of the land it was proposed to take from him by compulsion.

Mr. LITTLER intimated that the promoters would not oppose the auction clauses being applied to the debenture as well as the share capital, if the Committee thought such a course desirable.

Thursday, March 15.

Mr. LITTLER, summing up the case on behalf of the promoters, alluded first to the opposition of Mr. Allen, who asked for special protection for land belonging to him, which he alleged would be depreciated in value by the proposed works. He (Mr. Littler) ridiculed the idea that there was any justification for such a claim; and he pointed out that, if it were conceded, the Committee would be bound, in consistency, to admit similar claims from every person who was within 300 yards of the premises. To admit such claims, would obviously be to kill the Bill. Passing from this point, he came to the question involved in the application of the Hendon and Finchley Urban District Councils for a clause giving them compulsory powers of purchase. He did not know whether the Committee would accept his suggestion, that they should directly take the opinion of the authorities of the House as to their power to insert such a clause, or whether they would wish him to deal with the point. To introduce such a provision in a Bill of this kind would be entirely a new departure.

The CHAIRMAN: You need not address yourself to that question. The Committee have no intention of departing from precedent.

Mr. LITTLER said, in that case, he would proceed to deal very shortly with the subject of illuminating power. In one sense, this was not a very material question to the Company; because, in practice, they had already brought themselves over the 15-candle margin—having supplied as high as 15·8-candle gas. But it was one thing to be able to do this voluntarily, whilst earning their maximum dividend, and quite another thing to have it imposed upon them without regard to the state of business.

The CHAIRMAN: I think the Committee have indicated pretty clearly that it is their intention to impose the 15-candle standard.

Mr. LITTLER said the only difference it would make to the Company was in the effect on the price, whether standard or maximum.

The CHAIRMAN: We would like you to address yourself to what you consider should be the standard price.

Mr. LITTLER: If the Committee have formed a decided view that there ought to be a sliding-scale——

The CHAIRMAN: We have.

Mr. LITTLER: Then that assists me. Our own view was that the maximum price system was the best in the interests of the consumers themselves; but as the Committee have decided in favour of a sliding-scale, I do not urge the point, because it is not of the essence of the Bill. He (the learned Counsel) then went on to consider, on the assumption that there was to be a sliding-scale, what should be the standard price. With the single exception of Harrow, no case had, he said, been adduced, or could be adduced, in which a Parliamentary Committee, imposing a sliding-scale, had not granted a standard price in excess of the previous selling price. The amount of excess differed; it was sometimes 1d., sometimes 1½d., sometimes 2d. or more, but always something beyond the actual price. He suggested that the reason why Parliament had always done this was that Parliament felt that, before a company was penalized, it should be allowed a reasonable margin of profit to meet such contingencies as strikes, rises in the price of coal, &c.; and the margin so allowed had usually been about 3d. The price at present charged by the North Middlesex Gas Company was 4s. 3d. per 1000 cubic feet—largely within the maximum of 5s. which they had a legal right to charge. Besides this they had the right in case of emergency of dropping the illuminating power to a bare 14 candles. This latter right, which meant the power of saving 2d. per 1000 cubic feet, the Committee were now going to take away from them. He did not complain of its being taken away from them in the course of a fair and reasonable adjustment; but he contended that the imposition of the 15-candle standard was equivalent to the raising of the present price of 4s. 3d. to 4s. 5d., and, adding 1d. for contingencies, it was not too much for the Committee, on the facts before them, to grant a standard price of 4s. 6d. He contended that this would be the reasonable sum, just as 4s. 9d. would have been if a maximum instead of a standard had been granted. On the question of the amount of new capital to be sanctioned, he admitted that where, as in the old days, the existing shareholders had the opportunity of distributing capital at par amongst themselves, it was desirable for Parliament to hold a tight rein; but the introduction of the auction clauses had entirely put an end to any such necessity. Capital must now be issued at auction, and all the premiums carried to the capital account without bearing interest. Therefore there was no inducement for a company to issue any capital whatever unless it was really wanted; and in this case moreover the Company had bound themselves to issue only a limited amount of capital per annum—£8000 the first year, and £6000 in any subsequent year—reserving only the power, if they did not issue it one year, to issue it the next. There was, therefore, every reason now why Parliament should be liberal in its allowance. The main question at issue between Mr. Stevenson and Mr. Woodall was whether the future expenditure was going to be at the rate of £500 or £700 per 1,000,000 cubic feet of gas supplied; and having regard to the exceptional circumstances of the Company's business, and to the experiences of neighbouring companies, he contended that the larger sum was the reasonable one.

The room was then cleared. When the public were re-admitted,

The CHAIRMAN said: The Committee find that the preamble of the Bill is proved. Subject to a clause providing for no gas manufacturing or storage plant being placed within 100 feet of the main-road, the Company will be empowered to carry out its provisional agreement to take land. The Committee do not propose to pass any clause to give special protection to Mr. Allen. The capital the Committee sanction is £35,000 (including premiums), with the usual borrowing powers. The capital is to be sold by auction; and the debentures also. The illuminating power is fixed at 15 candles. The testing is to be conducted, as before, at the gas-works. The price of gas is to be on a sliding-scale; and the Committee have fixed the standard at 4s. 3d.

It having been arranged that clauses to give effect to the decision of the Committee should be prepared, the proceedings terminated.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, March 14.

(*Before Mr. Justice* CAVE *and a Common Jury.*)

Butler v. The Commercial Gas Company.—Claim for Compensation for Injuries.

In this case, the plaintiff claimed damages from the defendants as compensation for injuries received by him in consequence of alleged negligence.

Mr. HARRIS, Q.C., and Mr. G. THORNE DRURY appeared for the plaintiff; Mr. HOLLAMS represented the defendants.

Mr. HARRIS said the plaintiff was a plumber and decorator. On July 4, 1894, he was passing along King Street, Tower Hill, on his way to the Minories, when a flagstone on which he trod tilted, and then sank some 5 or 6 inches, and water spurted up over him. It appeared that the defendants' servants had opened the pavement at the place in question, in order to put in a gas-pipe for the purpose of the illumination of the Tower Bridge on the occasion of the inaugural ceremony; and in opening the ground, the gas men had perforated a water-pipe, which caused the earth to sink, and so brought about the accident. The plaintiff had sustained a contusion of the temple and the elbow, which had caused him to lose work.

Plaintiff and the witnesses of the accident having been examined,

Mr. HOLLAMS proceeded to call his evidence, during the course of which

His LORDSHIP said he did not see the use of proceeding further with the defence, as the defendants' witnesses admitted that there had been a fracture of the water-pipe by the men employed by the Company.

The jury, without retiring, found a verdict for the plaintiff; and assessed the damages at £30.

Additional Storage at the Spalding Gas-Works.—At the last meeting of the Spalding District Council, the Gas Committee recommended that a new gasholder be obtained, 80 feet in diameter and 24 feet deep, with a brick or concrete tank. The storage capacity would be 120,637 cubic feet; and the estimated cost was £1450 for the holder and £1500 for the tank; making together £2950. It was now stated that the present balance in hand on the gas-works account was £2190; but it was pointed out that the whole of the money would not be required for some time, and that by the date the work was completed there would be ample funds in hand. The report of the Gas Manager (Mr. J. G. Hawkins) was then read, wherein it was stated that the increasing demand made it highly necessary that additional storage should be provided. The consumption of gas during February, although a large increase upon last year, would have been much greater if it had not been necessary to take off the pressure in order to make the supply hold out. Mr. Hawkins was then called in, and he stated that the storage capacity was 90,000 cubic feet; but for the past two months they had been sending out 130,000 to 140,000 cubic feet daily. They ought not to have storage for less than a day-and-a-half's consumption; but they only had two-thirds of a day's demand. If anything occurred to interrupt the manufacture of gas, the town would be in darkness. He stated that, with the four beds of retorts at present in use, they could manufacture rather more than 140,000 cubic feet of gas a day; but they could not keep all the retorts regularly going from want of storage. He intimated that there was another bed of retorts not in use. The recommendation was unanimously adopted.

Dover Gas Company.—The half-yearly general meeting of this Company was held on the 4th inst.; Mr. W. Mannering in the chair. The Directors in their report stated that the half year ending Dec. 31 last would be remarkable in the history of the Company, in consequence of the large extension of the use of the incandescent gas-burner. It would, they said, be a most valuable assistance to the Company in the approaching competition with the electric light, which it rivalled in brilliancy and power, while its cost bore no approximation to that of lighting by electricity. They added that there had been a fair increase in the consumption of gas, and that the general result of the Company's operations had been financially successful. They recommended the declaration of the full dividend (7½ per cent.) allowed, which would leave a balance of £69 17s. to be carried forward, after providing everything necessary for keeping the works, which are under Mr. R. Herring's supervision, in a proper state of efficiency. The Chairman, in moving the adoption of the report, stated that 33 consumers had been added to their list, 37 meters fixed, and 147 gas fires and stoves let on hire. The increase in the consumption of gas had been 1·47 per cent. With reference to the accounts, as compared with the corresponding half of 1893, gas-rental showed a decrease of £939, accounted for by the reduced price of gas—viz., 2s. 6d. against 2s. 9d. On the other hand, the residuals had increased by £235; and meter and stove rental by £43. The total revenue was £15,874, or £654 less than in the corresponding half year. Turning to the expenditure side of the account, coals cost £197 more—a larger quantity by 132 tons being used—and the cost per ton was 3d. more. The net cost of coal for 1894—deducting the profits on residual products—was 6s. per ton only, as against 11s. 8d. in 1890. The total expenditure was £13,122, or more by £173; leaving a profit-balance of £2752. The usual excellent results were obtained in the retort-houses. During the half year, 8521 tons of coal were used; and the quantity of gas made was 93,920,000 cubic feet, or equal to 11,022 cubic feet per ton of coal. The gas accounted for was 87,685,000 cubic feet, or 10,290 cubic feet per ton of coal; and the unaccounted-for gas was down to 6·64 per cent., which was very satisfactory. He testified to the efficient manner in which the officers and workmen continued to discharge their duties. The report was unanimously adopted. In acknowledging a vote of thanks to the Directors, the Chairman stated that, though the charge for gas had been brought down to 2s. 6d. per 1000 cubic feet, they did not mean it to stand there; and he hoped shortly to announce that it would be lower still. This would be their chief aim.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Eightieth Ordinary General Meeting of this Company was held last Tuesday—Sir FREDERICK T. MAPPIN, Bart., M.P., in the chair.

The GENERAL MANAGER (Mr. Hanbury Thomas) read the notice convening the meeting.

The CHAIRMAN, in moving the adoption of the report (see *ante*, p. 381), said he thought all would agree that the result of the half-year's working had been in every way satisfactory. They had spent a very small sum (only £563) on capital account. The two new holders at Grimesthorpe had enabled them to proceed very slowly with any extension of works in that direction. During the heaviest pressure for gas recently, they had eight beds—equalling something like 56 retorts—that were not lighted up; but in the winter of 1892, the whole of these retorts were at work producing an additional quantity of gas amounting to 650,000 cubic feet. The Board now felt that the time had come when it was not wise to defer proceeding with the works at Grimesthorpe; and possibly, in something like two years, they should require to make gas at those works. At all events, they could not delay any longer spending money in this direction. Turning to the revenue account, they would see the result of the half-year's working had been a profit of £43,695. This had been carried to the profit and loss account; and, after paying the full 10 per cent. dividend, they were left with £5564 to carry to the reserve fund—making that fund £85,144, or practically at its maximum, all but £1048. When they looked back to the result of the corresponding half year twelve months ago, they could hardly realize the great change that had come over them. The difficulties between the miners and their employers quite upset all their calculations in regard to the coal required for their undertaking. But they must bear in mind that, for the greater part of the past half year, the price of gas was 3d. per 1000 cubic feet more than they were charging at the present time; for since the middle of August last, consumers had been charged the lowest prices —1s. 10d., 2s., and 2s. 2d. per 1000 cubic feet, according to consumption. The way the balance had been arrived at was certainly surprising; and they would agree that was so, when he told them that the coal for the last six months had cost them £30,808 less than in the corresponding half of 1893. The cost of repairing and altering mains had been less by £1487; the receipts for tar had been £996 more; and for sulphate, £863 more. On the opposite side of the balance-sheet, it was seen they had received less for gas by £1835; and for coke, £1182 less. Stokers' wages had been £557 more; repairs and alterations of the works and plant, £7744 more; and rates and taxes, £809 more. If they compared one half year with the other, they saw that, after paying this large sum for alterations and repairs of works and plant, they made a profit of £20,288 more the last half year than in the corresponding half of 1893. The sales of gas had increased by 24,000,000 cubic feet; but they had not yet equalled the consumption of gas in the corresponding half of 1892 —due no doubt to the summer-like weather at the latter part of the half year, the competition of the electric light, and the number of Welsbach gas-burners that had been adopted by the consumers. He was sorry to say that the leakage in the works had been more than in the corresponding half year. In 1894, it amounted to 62,929,000 cubic feet; whereas in 1893 it was only 41,428,000 cubic feet. On the question of the difference, he had had some correspondence with the Manager. He was not altogether satisfied, because he could not feel they were working under the best conditions in regard to leakage, when he saw that Mr. Winstanley, of Coventry, the President of the Midland Association of Gas Managers, in his address to that body, told them that in Coventry the unaccounted-for gas was as low as 1·78 per cent., and that the average for the last four years was only equal to 2·42 per cent. He hoped, therefore, their Engineer would feel that something had to be done to reduce the loss they sustained' which last half year equalled 6·27 per cent. Mr. Winstanley also told the Association that the meters required as much attention as anything else; because he found that some meters would not begin to register until they had three 5-feet burners at work. He trusted the officers of the Sheffield Company would feel that something was necessary to be done to reduce the leakage that at present existed. The quality of the gas had been fully maintained. During the half year they had made 1123 tests, averaging 17·94-candle power; and for the whole year, 2097 tests, showing an average of 17·92-candle power. They had, therefore, supplied gas of 1½-candle power more than required by their Act; and they were very glad to send so high a quality to the consumers. The progress was altogether satisfactory in regard to appliances for increasing consumption. They had fixed during the half year 713 additional meters, from 2 to 300 lights, 548 gas-fires, 244 stoves of other kinds, and 47 additional gas-engines. Although considerable difficulty had been caused by the frost, in six weeks they had sent out an increased quantity of 46,000,000 cubic feet of gas, equalling 14·35 per cent. They had not thought it necessary to adopt the penny-in-the-slot meter, as had been done in many other towns. They had so many small consumers in Sheffield that he did not think the prospect of success for such a system would be the same as in many other places. If, for instance, they took London, where it had succeeded well, they found that, in 1893, The Gaslight and Coke Company had 217,966 consumers of gas on their books; the South Metropolitan had 88,993; and the Commercial Company, 21,821 —making a total of 328,780 consumers. But they must bear in mind that these Companies had a population of 4,500,000 or upwards. In the same year, the Sheffield Company had 48,956 consumers, to a population of (say) 330,000; so that, if they considered how gas had been supplied according to population, the London Companies, instead of having only 328,780 consumers, should have had nearly double that number. Professor Lewes had recently read a paper on acetylene; and if half of what he described was correct, as to its use in connection with the supply of gas, it appeared to him (Sir Frederick) that their undertaking was more assured than at any other time in regard to its future prospects. From what he could see, acetylene was made from coke, lime, and chalk; so the components of it could not be very costly. At their last meeting, he referred to the success of the Welsbach burner, and stated what it was doing—using half the quantity of gas and producing three or four times the light. The result of his remarks was that a good many letters appeared in the local papers; and one writer charged him with making very misleading statements. He did not think he was in the habit of doing this; at all events, he had no intention of so doing. It was true, he praised the light. But he did not think he said anything too much for it; for he found, after further experience, that it was quite equal to all he had stated. The Manager of the Electric Light Company said: "If it is true the Welsbach burner reduces the income of gas companies 50 per cent., it is difficult to understand the eagerness of gas companies to fix them." But surely if they could give an article worth double the money to that they had hitherto supplied, it was their duty and also their interest to supply such an article. Others had attacked the light on account of its being injurious to health. The *Lancet* appointed a Commissioner to inquire into this matter; and, after speaking highly of the electric light as the first from the point of view of health and light, it said: "From the same point of view, we are bound to place next, in the face of the result of our present inquiry, the incandescent gas-light in its improved form. It is even less productive of carbonic acid gas than the average oil-lamp, and consumes not quite one-half less gas than the existing type of burners—giving rise, therefore, to the evolution of half the heat and half the amount of carbonic acid gas, while its illuminating power (expressed in candles) is more than three times as great as the best ordinary gas-burners." Therefore he did not think that he said more than he was justified in saying in favour of the incandescent light. He had had it fixed in his own dining-room in Sheffield; and his friends who had seen it had said that it was as perfect a light as they had seen in any place. He had often called attention to the necessity of people using the best burners. To have a good light depended very much upon the form of burner used, and the pressure of the gas that issued from the burner. To acquire all these advantages from the expenditure that was incurred, it was necessary that they should have good governor burners. These were especially necessary in Sheffield, if necessary in any place. There was so much up-hill and down-dale in the town that, however careful the Gas Company might be, and however many governor-houses they might have, the consumer could always improve the light; and also keep his gas bill within moderate proportions. He wished to refer to the many explosions that had recently occurred in London and other parts of the country from the electric light chambers or boxes which had been made in the streets of large towns. They had had before them that day at the office a letter from Sir Courtenay Boyle to the Electric Light Committee of the St. Pancras Vestry calling their attention to what had just been discovered in these boxes—a deposit of sodium which, when it came into contact with water, was inflammable. If, under these circumstances, there was any gas in the neighbourhood, an explosion must take place. In some places the iron lids of the boxes and the paving-stones had been blown into the air; and he hoped that, in Sheffield, means would be taken to reduce the size of the chambers, for that was the course which Sir Courtenay Boyle recommended in his letter.

Dr. SORBY, in seconding the motion, said the report was so good that he was sure it would meet with their approval.

Mr. JOHN WILSON asked if there was any probability of the price of gas being reduced. Such a step would, he thought, be appreciated by the public, and be a benefit to the Company. They now had this new light running about; and if the Company could supply cheap gas, the public would not trouble about the electric light. The Company were now getting coal and everything else cheap; and if they could reduce the price of gas to 2s. per 1000 cubic feet, there would no doubt be an increased consumption.

The CHAIRMAN, in reply, said he was sure the shareholders must see and know that the Directors would be very ready when they felt themselves sufficiently guaranteed to reduce the price of gas. The situation was very different when they decided to raise the price from what it was now; and until they had had more experience of the coal trade, they would not venture upon a further reduction. Fixed prices in his opinion were much more advantageous than putting them up and down. It was with a great deal of hesitation that they raised the price of gas; and now they were only returning to the normal state of things that prevailed before the coal crisis. They were bound to supply the town with gas as people required it; and they must incur outlay, not knowing whether it would be needed in the near future or not. At present the Directors were not able to hold out any hopes of the price of gas being immediately reduced. The subject had not been discussed by his colleagues; but when an opportune time came, the shareholders would find the Directors were ready to do their duty.

The motion was then put and carried.

The CHAIRMAN next moved the declaration of the maximum dividend of 10 per cent.

Mr. E. HALL seconded the motion, and it was adopted.

Mr. T. W. SORBY moved a vote of thanks to Sir Frederick Mappin for presiding; saying the shareholders were exceedingly glad to see him present. He knew he was expressing the wish of all present when he said that he hoped Sir Frederick would be spared for many years to direct the affairs of the Sheffield Gas Company in the able manner to which they had practically become accustomed, but which they appreciated very highly indeed.

Mr. T. WATERHOUSE, in seconding the motion, said the sound position of the Company was in a great measure the result of the admirable Board who had presided over their affairs for a great many years, and of the exceptional ability of the Chairman. A better man of business there was not, he believed, in this or in any other town. With regard to the suggested reduction in the price of gas, he said the price in Sheffield would compare favourably with that charged in any similar town in England. He did not know that Sheffield was exceptionally favoured in its position for manufacturing gas cheaper than other towns; and that therefore their terms should be lower. The price in Manchester was higher than in Sheffield, although that city was 40 miles nearer Wigan, whence a great deal of cannel coal was obtained. He thought there was ground for satisfaction, as the

Sheffield Company were now supplying a better quality of gas than ever before.

The motion was agreed to.

The CHAIRMAN thanked the meeting very sincerely on behalf of himself and colleagues, and also included the officials of the Company, who had much to do, he said, with the success of the undertaking. They all, he was glad to say, worked cordially and heartily together; and he thought the success they had hitherto attained had been in a great measure due to this fact. He had no doubt they would be able to sell gas in the future at as low a price as any other gas company in England. If they did this and maintained the quality as at present supplied, the public must be satisfied—at all events, they ought to be.

This concluded the business of the meeting.

LEICESTER CORPORATION GAS AND ELECTRIC LIGHTING AND WATER DEPARTMENTS.

Financial Reports—Abolition of Gas-Meter Rents.

At a Special Meeting of the Leicester Town Council last Tuesday, the half-yearly balance-sheets of the Gas and Electric Lighting and Water Committees were submitted, together with a proposal that gas-meter rents should be abolished.

Alderman LENNARD, in moving the adoption of the financial statement of the Gas Department for the half year, said he was pleased to say the profit, after paying the contribution to the sinking fund, was £12,848. This was an increase of £3506 compared with the corresponding period of 1893. The June half year left them with a profit of £14,049; and putting these two amounts together, they had a total profit of £26,897 for 1894—being an increase of £6878 on 1893. There were various ways in which the profits might be disposed of. They had two funds which were not at all adequate for the purpose for which they were created. The reserve fund contained £5000; and the renewal fund had nothing standing to its credit. But, under the circumstances in which the Finance Committee had found themselves in the last two years, and looking at the future, the Gas Committee had resolved to recommend that the whole of the profit be handed over to relieve the district rate. The total receipts had been £91,636, or an increase of £6232; while the expenditure had been £62,540, or an advance of £2663. They had paid for coal £32,726, which was an increase of £1330. Wages for carbonization amounted to £6791—an augmentation of £182. It might have struck many of the members that, considering the extra work of the department, and the additional quantity of coal carbonized, this was an exceedingly small increase in the amount of wages; but it must be remembered that they were comparing the results of 1894 with 1893 when they had the coal strike on, and when they had to manipulate the coal in a far more costly way. They had then to get as much gas out of the coal as they could, regardless of residuals. The receipts showed an increase of £4417 compared with the same half year of 1893. This was a most satisfactory advance; showing that, notwithstanding the introduction of the electric light, the consumption of gas was progressing very satisfactorily. It would be observed from the balance-sheet that they had four prices for gas; and he had been in receipt of a good many letters from people in the town who thought that the Committee made various charges in the town itself. They did not do so. The lowest charge they made was 2s. 4d. to the ordinary private customers, whether they were large or small. They charged 2s. 8d. to Oadby, and 3s. to Ansty, Glenfield, Ratby, and such places; while 3s. 4d. was charged to those who had prepayment meters. In connection with the latter amount, there was considerable expense in collecting the money. Their rents had decreased by £123. One or two of the principal factors in determining the profits were the coal purchased and the coke sold. Their coal had cost them 11s. 1d. per ton, as against 13s. 1d. per ton in 1893. The residuals had realized 60 per cent. of the total cost; the coke being sold at 8s. 1d. per ton. During the coal strike, there was an increased consumption of coke, which had since been well maintained. The total amount of profit realized, including the interest on the sinking fund, was a little better than 7·52 per cent. Mains had been considerably extended during the year. The total sum they proposed to hand over to the revenue of the borough—and they had estimated for next year a very liberal amount—was, as he had stated, £26,897 15s. 8d.; but since this estimate was made, an unfortunate cloud had hung over the town, and which, he was afraid, would seriously affect the Gas Department. But although he believed he could stretch a point and promise their Chancellor of the Exchequer assistance from the Gas Department next year, he thought it only right that he should say that they could not undertake to hand over the whole of the profits in future years.

Mr. POCHIN seconded the motion, which was carried.

Alderman LENNARD next moved that the report relating to the Electric Lighting Department be adopted. This, he said, was the first balance-sheet which had been submitted; and he could not help reverting to past discussions as to whether or not it was advisable they should enter into the undertaking, and when he was taken to task for being so bold as to say they would not come on the rates for a single penny of loss. The Committee had passed through the most trying stages of a new undertaking—viz., the initial stages—and they now came before the Council with a balance-sheet showing £130 paid towards the sinking fund, which was equivalent to profit; and there was only a loss of £190 up to Christmas last. They did not propose to take this out of the rates; but to bring it forward to the present year's account. He believed the current year's complete balance-sheet would show a profit on the price now charged. It would be observed that the item of fuel on the expenditure side of the account was exceedingly small. They placed the installation on the site of the gas-works; and they had such plant that they could burn the refuse fuel—thereby saving £1000 a year. He might add that the highest demand upon them had only been equal to one-sixth of their capacity. As a matter of policy, the Electric Lighting Sub-Committee and the Gas Committee believed that, to begin with, they should charge a fair price. As soon as ever they could afford it, they held that they ought to reduce the charge; and they were sanguine that before the present year was out, they would be able to make a reduction from 6d. to 5d. per unit. Eventually he believed they would be able to supply it at 4d. The formal opening of the works had now been fixed. Some weeks ago there was an account in the papers of an explosion in a transformer chamber in Market Street. There were about a dozen such chambers in the town as the one in question; and inside each was a box containing the ends of cables, in order to protect which the boxes were filled with oil. There had been similar explosions in various parts of the country; some of them very serious, and involving loss of life and damage to property. After investigation, Mr. Colson came to the conclusion that the explosion in Market Street was due to electrical causes only—that the oil had become gasified; and that a spark had produced the explosion. This was a new theory confirmed since by experts, who regarded it as of very great importance. To have discovered the cause meant the removal of the danger in future; and the public need not be under any alarm in regard to the matter.

Mr. CLARKE seconded the motion, which was agreed to.

Alderman LENNARD then moved the confirmation of the remainder of the report of the Committee, including a recommendation that from June next no rent should be charged for gas-meters. This, he hoped, was the end of a very long contested question. He might be accused by some of inconsistency, because he had had in the past to defend the principle of meter-rents; but while he now supported the Committee's recommendation, he did not admit that in the past they had done wrong in making a charge for them. The rent was 6d. less now than in the time of the old Committee, which practically meant handing about £25,000 to the relief of the rates. It should be understood that they only supplied wet meters; but it was an erroneous idea to suppose that only wet meters were affected by frost, as, during the recent severe weather, dry meters froze quite as readily as wet ones.

Mr. BRUCE, in seconding the proposition, said it came as a great surprise to him in Committee when Alderman Lennard announced that he was going to propose the absolute abolition of meter-rents, especially after the strenuous opposition of himself and others on previous occasions.

Mr. EDWARDS supported the motion; being one of those who believed that meter-rents were an unjust impost, not so much upon the large as upon the small consumer. However much they reduced the rates, the rent of small houses was not lowered; but by the proposal now made, these people would obtain some amount of direct benefit. He thought it high time that the small consumer received some benefit from the profit made on the gas supply.

Alderman WOOD pointed out that Mr. Bruce was not quite accurate in his facts. He (the speaker) was the first to introduce the question of the reduction of the meter-rents in Committee. He objected to newly-elected men in the Council, who had had no knowledge or experience of municipal work, asking for the immediate abolition of meter-rents, without taking into consideration any consequences that might follow. What he advocated was that they should proceed by gradual degrees first, and in the end small meter-rents would be abolished.

Alderman COLEMAN and Mr. SQUIRES both asked what the Committee were going to do in the case of meters owned by private persons.

Mr. BIGGS congratulated the Chairman and the Gas Committee on having agreed to sweep away the meter-rents; and he wished the Chairman could also see his way clear to abolish the fittings department. He was not speaking for himself; but there were a large number of small tradesmen who suffered a great injustice through the private trading of the Corporation. This applied not only to the Gas Department, but to the Water and Electric Lighting Departments; and he thought there ought to be no difficulty in dropping this business. He would not move a resolution on the subject, as he did not wish to take a hostile step against the Committee; but he hoped they would see the justice of carrying out the suggestion.

Mr. TURNER asked whether they were not proposing to abolish what was felt to be an injustice, and imposing another by charging for the laying on of the electric current.

Alderman LENNARD, in reply, said it would be to the interest of the department and to the customers to reduce the price for the supply of the current for electric lighting whenever they could. With regard to taking over the meters of private owners, the Corporation were not bound to supply meters to consumers; and therefore they were under no obligation to buy private meters. With regard to what Mr. Biggs had said, when that question arose, he could show it was a just, right, and politic thing for the Corporation to take these matters in hand.

The motion was adopted.

Alderman WOOD followed by proposing the adoption of the financial report of the Water Committee, and pointed out that they had a net profit of £1367 to hand over to the district rate fund. This had been a bad year for the Water Department; but the circumstances had been exceptional. They had had other bad years; but on the whole they had been successful, as they had paid £88,000 in aid of the rates since the Corporation took over the water undertaking.

The MAYOR hoped the Committee would consider how they could give some little benefit to the consumers, as the Gas Committee had done to their consumers. He called attention to the difference in the water-rate, varying from 6½ per cent. upon the assessment of small houses to 4½ per cent. upon large houses. He considered the time had come when the rate ought to be made uniformly 5 per cent.

Alderman WOOD replied that the difference in assessments of small houses affected the property owners, and not the poor consumers.

The report was adopted.

Extensions at the Pontypridd Water-Works.—The Directors of the Pontypridd Water Company, Limited, have accepted the tender of Messrs. John Aird and Sons for the construction of the new reservoir and filter-beds at Mardy, Rhondda Fach, as authorized by the Company's Act of 1892. The new reservoir will be constructed some three miles higher up the valley than the present works; and it will have the capacity of 200 million gallons. The amount of the contract (including also the construction of a tramroad to the site of the new works) is stated to be between £50,000 and £60,000.

THE GAS, ELECTRICITY, AND WATER DEPARTMENTS OF THE BRADFORD CORPORATION.

The Working of the Past Half Year.

At the Meeting of the Council of the County Borough of Bradford last Tuesday—the MAYOR (Alderman W. Willis Wood) in the chair—the financial statements of the Gas and Electricity Committee and of the Water-Works Committee were presented.

Mr. W. C. DIXON, the Chairman of the Gas and Electricity Supply Committee, moved the adoption of the minutes of the Committee. In so doing, he said that for the half year ended Dec. 31 last, the revenue account for the Gas Department, including the chemical works, showed a net profit of £6345. In the corresponding half of 1893, there was a net deficiency of £10,500, owing to the coal strike. There was, therefore, a difference of £16,845 in favour of the past half-year's working. There had been 77,066 tons of coal and cannel, costing £42,368, carbonized during the half year, as compared with 77,887 tons used in the last six months of 1893, at a cost of £63,310. Repairs of works and retorts had cost £7530—an increase of £1641; but this was due to the expenditure upon alterations, and new work carried out, at the Mill Street and Valley Road works. Repairs of mains and services had cost £1616, or £626 less than in 1893; and cartage and yard labour, £2394, or an increase of £690. The gas produced during the half year was 808,748,000 cubic feet, being 35,000,000 cubic feet more than in the corresponding half of 1893. The receipts from the sale of gas were £72,995, or an increase of £2471; coke yielded £10,271, as against £13,506; and tar, £4433, or an increase of £262. The ammoniacal liquor supplied to the chemical works had this half year been charged at the average market price, which amounted to £4578. In addition, a net profit of £3406 had been made by the sale of chemicals; making the total up to £7984. In 1893, the profit, without charging for liquor, was £9123. So that, in comparison with last year, the chemical works had made £1139 less profit. In addition to the net profit of £6345, a sum of £10,800 had been spent by the Gas Department in lighting and maintaining the street-lamps for the half year. It was estimated that 77,502,000 cubic feet of gas had been consumed by the public lamps. On Dec. 31 last, there were in use in the borough 6705 ordinary lamps, and 831 Bray's lamps; being an increase during the half year of 72 lamps. Turning to the Electricity Department, he said that there was a total income of £6349, against £5642 in 1893; and a gross profit of £3512, against £2876 in 1893. The cost of working the plant had been £2836, against £2765 in 1893. After deducting from the gross profit, income-tax, interest on loans, and sinking fund, there remained a net profit of £1449, against £1179 in 1893. A depreciation fund had now been started; and £1062 had been put to that account—leaving a balance of £387, against £1179 in 1893. This sum of £387, with the balance from the previous half year, made the total profits unappropriated on Dec. 31 last, £2817. In conclusion, Mr. Dixon said he believed a profit had been made in every department, which could not be said last year.

Mr. KAY seconded the motion, and it was carried.

Alderman HOLDSWORTH, the Chairman of the Water-Works Committee, moved the adoption of the minutes of the Committee, which included a resolution proposing to buy 94 acres of land, with buildings thereon, at Chellow Heights, at the price of £225 per acre; the land being required in connection with the construction of a service reservoir under the Nidd water-works scheme. He said that the negotiations for the purchase of this property had taken the greater part of six months to complete; and he believed the settlement arrived at was a fair and equitable one. Referring to complaints about defects in the supply of water, he said that in not a single instance were the Committee to blame; and notwithstanding that there were some thousands of pipes for which the Corporation were not responsible still frozen, he was pleased to say that out of the several hundred miles of mains in Bradford not a single yard had been frozen up. Complaints had also been made about the peculiar taste of the water. This, he said, was due to the reservoirs being frozen over, and the water not getting oxygenated; but there was no cause for alarm. A very heavy draught had been made on the high-level service in consequence of taps being left open during the frost. The supply was not, however, in a very bad position now; and he thought that, by the end of the present month, it would have been increased sufficiently to enable the town to get through the summer fairly well. If this result was not secured by the end of March, he would give instructions for pumping from the low level to the high level, so that the inhabitants of Bradford need not feel afraid of being short of water.

Mr. R. PRATT seconded the motion, which was adopted.

SMETHWICK GAS SUPPLY.

The Working of the Gas Undertaking in the Past Year.

The annual report and statement of accounts of the Gas Department of the Smethwick District Council for the year ending Dec. 31, 1894, were issued last Tuesday by the Secretary (Mr. W. J. Sturges). The report states that the borrowing powers of the department were not increased during the year; the amount authorized standing at £182,709. The sum actually raised was £169,381 (the same as in the previous year), of which £7541 has been repaid out of revenue; leaving the outstanding debt £161,839, and the balance remaining to be borrowed £13,328. During the year, £318 was expended in laying new mains, and £376 in the purchase of additional meters, including £113 for prepayment meters, and £31 for materials and labour in fixing them. The total capital expenditure stood at £168,614 on Dec. 31 last; the balance unexpended being £767. The sale of gas during last year augmented to the extent of 4·12 per cent.; the income from this source showing an increase of £669. The bulk of this was in the accounts of large consumers at the 2s. 6d. rate. The coke and breeze yielded £4307, or about £8 in excess of the previous year. The make per ton of coal was practically the same as in 1893; but the quantity of coal carbonized exceeded that of the previous year by 1160 tons—giving an increased coke production of 689 tons. Tar realized £852; being a decrease of £133. The yield per ton of coal dropped from 11·46 to 10·23 gallons. This accounted for £75 of the deficiency; the remainder being due to the lower price obtainable under the new contract, which took effect from the 1st of October last. The sale of the liquor showed an increase of £149, attributable to the improved yield per ton of coal and to the additional bulk of coal carbonized. The profit on the gas-fittings amounted to £89, compared with £59 in the previous year. The total income from all sources was £27,472, as compared with £26,750 in 1893; being an increase of £722. The coals were slightly cheaper—about 4½d. per ton less than in 1893; but the amount expended under this head was higher in consequence of the larger quantity used. The cost of purification showed a decrease equal to £115 on the quantity of gas made during the year. There was also a saving of upwards of 1d. per ton of coal in the carbonizing wages. The cost of repairs and maintenance of works was less by £111. Lighting, repairing, and maintaining the public lamps cost £626, against £591 in 1893. The number of lamps in the district was increased from 811 to 835. The rates and taxes were higher by £94. The management charges decreased by £25; and the bad debts amounted to £13. The total expenditure came to £17,521, which would be increased to £17,921 if it was decided to put in an additional reserve of £400 for retorts, which gave an augmented expenditure of £467 as compared with 1893. With the exception of rates and taxes and bad debts, there was a decrease in the cost per ton of coal in every item of expenditure; while the total, including the £400 reserve, showed a saving to the extent of 1s. 1d. per ton. The gross profit for the year was £9550, or an increase of £255. After making provision for interest charges, &c., there remained a net profit of £2009, or £1609 deducting the £400 reserve. From this had to be taken £600, which the Gas Committee had agreed to hand over to the general district fund account; leaving £1009 towards wiping out the balance of £2347 on the regenerative plant account.

With regard to manufacturing operations, there was an increase of 2½ per cent. in the amount of coke used for fuel purposes, which was 2020 tons in 1894, as compared with 1650 tons in 1893. The value of coke used had been estimated at 10s. 6d. per ton. The average selling prices for the past year were 12s. 11d. per ton for coke and 10s. 6d. per ton for breeze, against 12s. 11d. and 11s. 6d. for 1893, less 1s. 5d. per ton for wages, discounts, and other items. These figures Mr. Sturges anticipated would be considerably diminished for the current year; prices having fallen very much below the values in 1894. From the revenue account, it appeared that the cost of the manufacture of the gas was £14,393; while the amount set down for management was £1154. The income from the sale of gas amounted to £21,051; and that from residual products, to £6332.

THE PUBLIC LIGHTING OF GLASGOW.

Important Extension of the Welsbach Incandescent System.

The experiment in public lighting commenced last summer in St. Vincent Street, Glasgow, and incidentally brought under the notice of the meeting of the North British Association of Gas Managers held near the end of July in that city, has been eminently successful. Mr. Hamilton, the Inspector of Lighting, has most carefully studied the working of the Welsbach incandescent lamps installed in that street, and has experimented much with them. He finds, however, that, as a rule, the mantles that were fitted to burners consuming 4½ to 5 cubic feet of gas per hour were too large if their long life was a *sine quâ non*; and he has now replaced the burners with others, by which the consumption of gas is only 3½ cubic feet per hour, and he is likewise getting smaller mantles for the lamps. Still it is specially worthy of mention that a number of the mantles used have done satisfactory work for more than 1800 burning hours—certainly since the month of November of last year.

His experience gained with the St. Vincent Street installation has warranted Mr. Hamilton in taking action elsewhere throughout the city, in the same direction. In Blythswood Square, which stands at a considerable elevation, and where the breezes freely play, another lighting experiment of the same kind has been started within the past few weeks. On the footpath surrounding the inner enclosure of the square, eight Welsbach incandescent lights have been installed—two on each side—each burner consuming 3 cubic feet of gas per hour. For a residential portion of the city, Blythswood Square is now exceedingly well lighted. In and around the square, there are in all 27 lamps, 19 of them, on the pavements fronting the dwelling-houses, being fitted with ordinary flat-flame burners.

At Bridgeton Cross, in the East End of the city, where there is a large open space surrounded by tramway lines, and having a covered verandah in the centre, Mr. Hamilton has now employed Welsbach lamps exclusively, thirteen in all, each using 3 cubic feet of gas per hour. This open space is now brilliantly illuminated.

Probably the most important experiment which the Glasgow Lighting Inspector has yet made with Welsbach incandescent lamps is the one he has started within the past few days in a very short thoroughfare known as Gordon Street, near to, and parallel with, St. Vincent Street. At one end of it there is the Central Station of the Caledonian Railway, along the front of which there are a number of powerful electric arc lamps to compete with. There are also throughout the rest of the street, but at irregular distances apart, a number of other lamps of a similar kind, which, however, cease to throw out their effulgence after the shops and other places of business close. It will thus be seen that Mr. Hamilton has had a serious difficulty to contend with. All the public gas-lamps in this thoroughfare, except at two corners, are of the Welsbach type. A considerable amount of interest is being taken in this experiment, but the Inspector of Lighting is confident that he will come out of it successfully. He is privately making a number of tests with mantles of different sizes, with burners of varying power for them, and with lamp-fittings of his own devising; and the result will probably be that the reign of "Welsbach" in Glasgow will now be a very important feature of its municipal economy.

ELECTRIC LIGHTING NOTES.

In the course of a report on the revision of the charges for electricity, the Engineer of the Brighton Corporation Electricity Works (Mr. Wright) reviews the results obtained under the sliding-scale system of charges adopted by the Corporation in 1893. After two clear years' experience, Mr. Wright is able to write as follows: "The business has nearly quadrupled during the two years; and the rate at which new customers have been annually connected has exceeded that of the period when the sliding-scale was not in force by 80 per cent., exclusive of the Brighton and Hove Electric Lighting Company's customers. The object of the sliding-scale form of reduction was to increase the productiveness of the plant; and the benefits which it offered to the long-hour consumers has had the desired result of lengthening the average time during which the light is used. The extent of this improvement actually amounts to 25 per cent., or to put this in figures: In 1892, 530 units were sold per electrical horse power; whereas in the twelve months ending 1894, the average was 660 units. In 1892, when the uniform charge of 7d. was made, £15 12s. 4d. was derived as revenue per electrical horse power; whereas in 1894, when, although, owing to the sliding-scale, the average price obtained had fallen 14 per cent., the revenue per horse power was £16 8s. 4d. The average number of units sold per lamp fixed has largely increased since the sliding-scale was adopted. The day load has actually increased more rapidly than the night load." Mr. Wright's further observations showed that this increased productiveness of plant had enabled them to provide electricity in 1894, at a lower working cost than any figure yet published of any other electric light station—viz., 2¼d. per unit. He also gives statistics to show that he was quite satisfied that the wisest form the revision of tariff could take would be as follows: "(1) To reduce the present two hours at 7d. per unit to one hour at that price, and to reduce the price on all current consumed after this time to 3d. per unit. (2) To abolish all meter-rents, except to those customers who use the light on the average less than one hour per day throughout the year. He is quite convinced, from the present customers' consumption, that this tariff will yield a large margin of profit in 1895, and offer such an inducement to small as well as large householders to use electricity wherever they burn lights longest, that the only advantage of gas over electricity—viz., that of price—will have been removed, as any customer using the light regularly more than two hours a day will pay less, light for light, than for gas at its present figure." The Electric Lighting Committee have resolved that, as from Jan. 1 last, the charges shall be reduced in accordance with Mr. Wright's recommendation; and that the rent for meters shall be 2s. 6d. per quarter, instead of 5s. The financial statement of the department for 1894 shows that the receipts amounted to £16,317; that the working expenditure was £6490; and that the amount carried to the net revenue account was £9800.

The Chairman of the Birmingham Electric Supply Company (Mr. H. Buckley) had a very agreeable statement to lay before the shareholders at their annual meeting on the 7th inst. It appears therefrom that during last year the increase in the output of current was about 20 per cent.; and the number of customers was augmented at the rate of 28 per cent. The net profit, including a balance of £409 brought forward, was £5609, which allows of the payment of a dividend of 4 per cent., the transference of £1602 to the credit of the depreciation reserve fund and £250 to the general reserve fund, with a remainder of about £1000 to be carried to the current year's accounts. On making this appropriation, the total of depreciation, general reserve, and undivided profits will amount to £6864. The carrying forward of the £1000 seems to be a wise proceeding, as the Company will shortly be undertaking considerable capital expenditure, which, in a great measure, will not be earning anything in the ensuing year; and moreover the Directors have announced their intention of almost immediately reducing the price to the customers. The charge at present varies, according to the amount of electricity used, from 8d. to 6d.; and the proposal is to reduce the scale from 7d. to 5d. The shareholders have consented to the nominal capital being increased from £100,000 to £200,000.

At last Wednesday's meeting of the St. Pancras Vestry, an explanation was asked in regard to the extinction of the electric light in the Tottenham Court Road on the previous Saturday, when this most important thoroughfare was thrown into darkness during the busiest part of the day. Mr. Dodd was the inquirer; and he alleged that the state of things he complained of had occurred frequently; while the power of the light was not what it should be considering the high price paid for it. The Chairman of the Electric Lighting Committee (Mr. Sweet) explained that the failure of the light was due to the bursting of a water-pipe, which caused the flooding of one of the culverts. This could not have been avoided. But whether or not the best thing had been done at the station to meet the difficulty was an open question, and one which the investigation which would be made would prove. There was always a chance of gas or water getting into the culverts. Mr. Clements said he wished to know whether Professor Robinson had given any warning of the dangers attending the escapes of gas and water into the culverts. Mr. Sweet replied that the Professor did not anticipate them; and that he (Mr. Sweet) considered that, while the installation was not perfect in every way, St. Pancras stood better in this respect than many other corporations and companies.

It will be remembered that, at the last meeting of the Birmingham City Council (*ante*, p. 551), the report of the Technical School Committee proposed, among other things, the grant of £6080 to provide electric lighting, fittings, and motive power at the new school in Suffolk Street. Mr. Bradley proposed, as an amendment, that the Committee be instructed to accept the lowest tender submitted on the specification originally issued to a selected number of firms; and, on a vote being taken, the amendment was carried by 30 votes to 28. It was thereupon intimated that the Committee would resign; but, upon the amendment being put as a substantive motion, it was rejected by 34 votes to 32. The matter was subsequently referred back to the Committee, and they met on Monday last week, under the presidency of Mr. Martineau, to further consider the question. It was again pointed out that, though Messrs. Fowler and Lancaster's tender was the lowest on the first specification, they were higher than the tender of Messrs. D. and G. Graham, of Glasgow, on the amended specification. After some discussion, it was decided to again submit to the Council the proposal that the offer of the Glasgow firm be accepted. The matter comes before the Council again at their meeting to-day.

Electric lighting affairs are not progressing very smoothly in Chester. At the last monthly meeting of the Council, the Lighting Committee recommended the acceptance of tenders which would be submitted for engines, boilers, and dynamos, amounting to £8518; but, curiously enough, the Chairman of the Committee (Mr. W. C. Deelay), while bringing forward the recommendation, acknowledged that he did not agree with it. He condemned the idea of accepting tenders from different people, in consequence of the great difficulty of coupling various makes of machinery together. They ought, he said, to go to some well-known firm, and get them to put up the whole system, and give a guarantee that they would run it for at least twelve months to the satisfaction of the Corporation. He also complained that Dr. Hopkinson had disregarded the instructions of the Committee in not sending out for tenders on the Oxford system. The Committee had information which showed that electric energy could be supplied at a less cost—or at any rate, the same cost—as the ratepayers were paying for gas; but he thought that if the Council went in for a low-tension system, without being able to carry it farther than the compulsory area, they would be guilty of a great error. The Deputy-Chairman of the Committee (Mr. B. C. Roberts), in formally seconding the motion to adopt the recommendation, said the action of the Committee was inconsistent, and their scheme incomplete. Alderman L. Gilbert condemned the scheme as one of the crudest ever submitted to the Corporation. One firm had declared that the specifications were so complicated that they could not make out a tender. Dr. Hopkinson's system was to cost £22,000; while Mr. Preece had estimated that the work could be done for £15,000. The Watch Committee, before the Electric Lighting Committee were called together, obtained thirteen tenders, and only one of them exceeded £15,000. He moved, as an amendment—"That the matter be referred back to the Committee, with instruction to treat with some firm or firms for the lighting of the city, and, failing to make satisfactory terms, to bring to the Council plans, specifications, and tenders for a complete scheme; and that it be an instruction to the Committee that any firm or firms tendering shall undertake to run it for a given time." Mr. R. C. Davies seconded the amendment. The Mayor (Mr. W. H. Churton) spoke strongly in support of the recommendation, defended Dr. Hopkinson, and pointed out that under his scheme it was possible to supply the light to the whole of the city. He assured the Council that, if it could not be supplied to the whole of the city, and also light the streets, he should never support the scheme. Regarding the proposal to borrow £25,000, he pointed out that the Committee wished to have a sufficient sum to cover the whole expenditure for some time to come, and not to have to apply repeatedly to the Local Government Board. He asked the Council to trust the skilled Engineer they had called in, and leave to him the responsibility. The amendment was then put and carried by 21 votes to 9. It was then resolved to ask the Local Government Board to sanction the Council borrowing up to £25,000. Alderman Gilbert was added to the Electric Lighting Committee.

The Borough Surveyor of Yarmouth has submitted to the Town Council a report on their electric lighting installation. Perhaps it is a little early to expect great results from this undertaking; but though the capital expenditure is now rapidly mounting up, the accession of customers up to the present is not such as is likely to afford the Council any considerable satisfaction. With regard to public lighting, the Borough Surveyor reports that the number of arc lamps in the streets will cost £700 per annum, as against £500 for gas. The public lamps are alight 3032 hours per annum; and at a charge of £700, the cost is rather more than 3s. 6d. per hour for all the lamps in the town. The lamps were alight 684 hours in January and February. Upon this basis the income was £185 9s. 4d., including an item of £60 2s. for 2404 units supplied to customers at 6d.; and the expenditure was £243 0s. 10d.—showing a loss on working of £57 11s. 6d. The items of expenditure, however, do not include the cost of house connections and extensions, which are paid for out of capital. The Borough Surveyor has every confidence that the accounts will soon balance themselves, and show some signs of a contribution towards interest, and repayment of capital account. Twelve additional customers have, he states, applied for 627 lamps; making a total number of 3095 lamps. As the average earning power of each 35-watt or 8-candle power lamp throughout the country is 10s. per annum, a sufficient number of lamps have been applied for to pay the whole cost of working. In the opinion of the Borough Surveyor, a fair estimate of the year's working is: Income, £2376; and expenditure, £1710—leaving £666 available towards paying interest and for redemption of capital. The report also calls attention to the fact that the borrowing powers of the Electric Lighting Committee will be exhausted before the present contracts are completed; and large sums are now being expended in providing meters, transformers, and additional mains. The Council have agreed to apply to the Local Government Board for a loan of £2000 for these purposes. Complaints as to the electric lamps being extinguished have been less numerous during the past than in the previous month, which is considered to be due to the improvement in the weather.

As anticipated in the JOURNAL a fortnight ago, there was a lively meeting at the Hampstead Vestry last Thursday, when the question of Mr. W. H. Preece's remuneration on future works in connection with the electric light installation, came up for discussion. The Lighting Committee recommended: (1) "That the Vestry do employ their own engineer to superintend the carrying out of all future work;" and (2) "That Mr. Preece be asked if he will act as Consulting Engineer to the Vestry, and on what terms." Possibly this recommendation would have been passed without much opposition, had not certain members taken up the cudgels on behalf of Mr. Preece. It was maintained that he had been assailed in a coarse manner; that the much-talked-of rearrangement of the arc lamps in the Finchley Road would not cost more than £100; and that such mistakes were unavoidable in a large undertaking like this. An amendment was moved—"That the Vestry do employ Mr. W. H. Preece to carry out all future work, and that his remuneration be 4 per

cent. on the outlay." A letter received from the Hampstead Ratepayers' Association was read, protesting against the retention of Mr. Preece's services, and complaining of the high cost of the current. Then followed a long and acrimonious discussion, in the course of which many curious and instructive details in connection with this experiment came out. Mr. Hall said that Mr. Preece's reports had been prepared by his subordinates. He was an able man, but had too much to do; and the electric light installation of the Hampstead Vestry ought not to be made the hunting-ground of Mr. Preece's sons and other people. Mr. Aitchison alleged that neither the erection of the station nor the laying of the cables had been done satisfactorily. Dr. Ryalls said Mr. Preece had already received between £1300 and £1400 as commission on the work so far done; and he had not much to complain of. Mr. Bell declared that there was a *clique* in the Vestry determined to do an act of injustice to Mr. Preece. Mr. Richardson, a member of the Electric Lighting Committee, pointed out that half an hour after the central station was open one of the machines broke down, the armatures having burnt up; and within twelve days after the starting of the station, the two dynamos failed, and two new armatures had to be fitted. In November, all the private consumers were in darkness, as the feeders of the main cable broke. The ratepayers would not get any return for their money for a number of years; while for current which cost 6½d. per unit to produce the consumers were charged only 6d.—a loss to the ratepayers of ½d. on every unit sold. Mr. Johnson felt sure that the ratepayers would shudder when they found out what the electric lighting had cost. The discussion was continued to a weary length; and in the end, only seven votes were given for the amendment in a full Vestry. A further amendment to the effect that the matter should be referred back was also lost; and the Committee's recommendations were agreed to almost unanimously.

"The electric light controversy in Cardiff is rapidly approaching a stage when it will become imperative for the ratepayers as a body to intervene with a view to reducing the present state of chaos into something like order." These were the opening words of a leading article in the *South Wales Daily News* on Wednesday last; and they were called forth—and justifiably—by the proceedings at the meeting of the Lighting and Electrical Committee of the Cardiff Corporation the preceding day. On that occasion, Mr. T. H. Riches spoke his mind on the subject of the electric lighting installation of the Corporation; his remarks being mingled with expressions of sorrow for what had been done in this regard. He complained that the Corporation had "two valuable machines" which were rendered quite inoperative because the engines attached to them were inefficient. The Corporation were, he said, spending a couple of hundred pounds a year on these rectifiers; whereas if they had carried them to the station, and put them on separate circuits, they would have saved the interest on £5000. The Mayor (Alderman Carey) remarked that in all the new installations rectifiers had been employed. Mr. Riches admitted that this was so where they had been put up with a definite object in view; but in their case the engines were not adapted to the rectifiers. At Portsmouth, they were designed for the purpose. The Mayor said the Corporation had employed the best manufacturers of machinery in the world. Mr. Riches acknowledged the capability of Messrs. Siemens to produce electrical plant, but still he contended that the machines at Cardiff were not at all suited to the work they had to do. He expressed the opinion that it would be far better for the Committee to alter the arrangement, put down the plant as it should have been done, and settle the matter. The Mayor said they must put their shoulders to the wheel and set the thing straight. Mr. Harpur said he felt very sanguine that all would come right. Personally, he was perfectly satisfied with the light. The Mayor thought this was very gratifying; and, with this comfortable feeling prevailing, the matter was adjourned till the next meeting. To-day, the Committee will have before them the four candidates they have selected out of the 38 applicants for the post of Manager of the electric light station; and they will probably make their selection. The gentleman chosen will have his work cut out for him; for finishing, as we began, with a quotation from the *South Wales Daily News*, "the ratepayers are losing all confidence in the Committee, and unless they take immediate steps to put their house in order, explain their position, and announce their proposals and plans for the future, we shall not be at all astonished to hear of a public indignation meeting of ratepayers which will demand from them what they appear to be so loth—or is it unable?—to give."

GAS AT THE HOBART (TASMANIA) EXHIBITION.

When the future historian comes to write an account of the world's progress in the latter half of the nineteenth century, he will, if he wishes to be faithful, give due prominence to one special feature which has contributed to that progress in a very marked degree. We refer to the important series of exhibitions which have followed the wonderful display made in the glass house in Hyde Park in 1851. Many of these have been attended with success; but, on the other hand, so many have been failures, that it was a plucky thing for the people of Hobart to resolve on having a cosmopolitan show in their beautifully environed town. Many were the difficulties which presented themselves; and among them not the least was the terrible trade depression which has of late afflicted the whole world, and has taxed the resources of the Australasian colonies with special severity. The Hobart Exhibition is, however, an accomplished fact; and it must be classed among the successes, and not among the failures. This in itself is satisfactory; but it is further gratifying to find that the gas industry is well represented at the exhibition. The Hobart Gas Company secured the contract for the lighting; and the manner in which they have carried this out has won the approbation of all concerned. The whole work was done under the supervision of Mr. G. H. Burton, the Company's Outdoor Superintendent, assisted by Mr. Watt.

The Company have a conspicuous and beautifully arranged court, where they have an effective collection of gas appliances for lighting, cooking, heating, &c. One or two examples of the Carron Company's and Messrs. Wilson's stoves are shown; but the leading feature of the court is a unique display of cookers, fires, stoves, and other gas apparatus manufactured by Messrs. Fletcher, Russell, and Co., Limited, comprising a pleasing variety of designs and finishes. Among these are two striking specimens of artistic ironfounding in the shape of cast-iron mantelpieces with over-mantels—one in enamelled walnut finish the other in ivory and gold—both fitted with gas-fires in chimatto finish; the designs and colours of the latter, with the tiles surrounding them, all harmonizing very effectively with the mantels. The attractiveness of the display was due in a large measure to the planning of the court and the excellent arrangements of the exhibits, both of which duties were ably discharged by Mr. W. J. Campbell, the Gas Company's energetic Secretary. In connection with the gas cooking exhibit, the Company have engaged the services of Mrs. Isabel Ross, who gives frequent lectures with practical demonstrations on cooking by gas; the cookers used being Messrs. Fletcher's.

In the lighting section, the Welsbach incandescent burners, Goodson's governor burners, &c., are shown, together with a very high-class assortment of gaseliers, regenerative lamps, pendants, brackets, and shades of every variety and colour.

With regard to the general lighting arrangements, the approaches to the buildings (which cover 11 acres of ground) are lighted by seven of Messrs. W. Sugg and Co.'s high-power lamps, while under the portico is one of the firm's suspension lamps. The vestibule, which is 50 feet square, is illuminated by three rings fitted together, and having altogether 74 of Messrs. Bray's burners. The main hall is 150 feet by 50 feet, and is lit by a lamp in which are four Welsbach incandescent burners of the "C" pattern, and eight burners of the same kind fixed on brackets. These light the centre portion of the main hall. At either end there is a double-tiered ring with 56 of Bray's burners in each. The concert hall, 145 feet by 70 feet, is lit by ring burners similar to the vestibule, but much larger; 460 burners in all being used to illuminate the hall. The art galleries on each side of the hall are 170 feet by 40 feet; and are lit by means of 38 Welsbach "C" burners in each gallery. The café, which is in the dome, is 50 feet square, and is illuminated with a double ring having 56 of Bray's burners; the stairs and lobby being lit up with brackets and lamps. The annexes are 3220 feet by 50 feet, and are well lighted by 69 rings having 12 jets in each; the rings being 45 feet apart, with a double ring, having 36 jets, at each intersection. There is also a row of lights running the whole length of the building on either side of the avenue, with red, white, and blue globes—over 1300 being used. The gardens are illuminated with Messrs. Sugg's high-power lamps.

The gas is conveyed to the buildings through a 10-inch main leading from the 18-inch trunk main to the city, for a distance of 100 yards. From this point to the entrance, an 8-inch pipe is laid, with smaller mains branching off to supply the different sections. The whole of the buildings are fitted up with iron pipe; upwards of 25,000 feet of various sizes being employed. There are 3300 jets in use every night and the gas consumption averages about 170,000 cubic feet per week.

The Tenders for the Paignton Reservoir.—A singular succession of errors is reported in connection with the tenders for the new reservoir for the supply of Paignton with water. Originally the contract was given to Mr. Rabbich, of Paignton, whose tender was the lowest; but he immediately discovered that he had made a clerical error of £500, and, at his own request, he was relieved of the contract. The District Council then accepted the tender of Mr. E. Tempest, of Manchester, for the sum of £5075; this being the next higher. At the last meeting of the Council, Mr. Tempest wrote that he had found errors in three items, which would add £180 to his estimate, and asking that his tender might be increased by this amount. The Council declined to make this change, and proceeded to accept the tender of Mr. H. Webber, of Paignton; the amount in this case being £5548.

The Extension of the Sittingbourne Water-Works.—Some difference of opinion having arisen as to the way in which the contract connected with the new water-works extension at Sittingbourne has been carried out, the Sittingbourne District Council called upon Mr. E. Easton, their Consulting Engineer, for a special report; at the same time intimating that many of the members were dissatisfied with the work as it has been left by the Contractors. At the meeting of the Council last Wednesday, the Clerk (Mr. Harris) stated that he had received Mr. Easton's report, and also that of a diver who had been engaged to examine the newly-constructed dam at the water-works well. Mr. Easton stated that he had instructed his chief assistant (Mr. Gritten) to go and look into the matter, and receive the report of the diver who had been sent down the well. He learnt from the latter that the brick dam was, to all appearance, perfectly sound, and that the hole had been bored into the new well through the sluice-cock and pipe. He also learnt that the old 6-inch borehole was stopped up, and that there was evidently a flow of water from the new 18-inch hole put in last year. The sluice-cock also was in working order. The diver further reported that besides some canvas which he brought up, there were still pieces of sheet iron left in the roof of the heading, which had been put there to protect the workmen. These tools and materials had been left by the Contractor's workmen when they were overpowered by water, as Mr. Easton had already reported. He thought the Contractor should be called upon to recoup the Board for the expense they had been put to in making the inspection, as far as it related to the clearing of the well. The diver did not think anything had been left in the well which would do any harm. In concluding his report, Mr. Easton said he believed he had given the best instructions to the Council to stop the works and close the contract when he did; but the result of the work done by Mr. Batchelor came up to all he had expected of it, and the future development of the water supply had thereby been doubled. A discussion ensued as to paying Mr. Easton for the work; but the Clerk advised that, however much they might be dissatisfied, they were bound to pay. After some remarks, in the course of which an opinion was expressed that the work had not been satisfactorily completed, it was decided to suspend settlement with Mr. Easton, and to request him to return the plans and specifications he had prepared for contract No. 2 in connection with the water-works extension scheme, and forward his charges for preparing them.

PORTHCAWL WATER SUPPLY.

Board of Trade Inquiry.

An inquiry, which extended over two days, has just been held by Major Marindin, on behalf of the Board of Trade, in regard to the application made by the Porthcawl Water Company, Limited, for a Provisional Order to enable them to carry out a scheme of water supply, for which an alternative scheme had been brought forward by the District Council. The Company propose to supply water at a rate of 2d. per week where the rateable value of the premises does not exceed £5; and at 10 per cent. where the value exceeds £5. They desire that they may not be required to deliver water at a greater height than could be reached by gravitation from the reservoir, tank, or works. In their objections to the Company's proposals, the Council state that they intend to bring from Kenfig Borough a better and cheaper supply of water for domestic and sewer-flushing purposes; that they are not satisfied with the quality of the existing supply; that they will have a service which will reach to the height of any house that exists or may be built in Porthcawl; and that they are prepared to charge only 5 per cent. where the rateable value is more than £5. In reply, the Company say that they have supplied water for a long time; that the quality is good; that the resolution passed by the ratepayers in November against the granting of a Provisional Order was the result of insufficient information being laid before the meeting; and that really the Council have no practical scheme to put forward. Mr. S. T. Evans, M.P., conducted the case for the Council; Mr. A. G. Rickards representing the Water Company. A large number of witnesses were examined on both sides; the evidence being given, chiefly by expert analysts, on the main point—the quality of the water supplied by the Company. It was alleged, on behalf of the Council, that the analyses taken for them showed that the water contained too much salt, and that it was contaminated to an undesirable extent by the percolation of sewage effluent from local cesspools. On the other hand, analysts for the Company submitted analyses in which it was stated that the proportions of deleterious matters, if any, were so small as to be imperceptible, and certainly not dangerous to health. The Council also submitted that the cost to the consumers under the present arrangement was higher than it would be if they introduced a new and better supply from Kenfig Borough; and that the Company's water could not be sent to the top of the highest house in Porthcawl in case of fire. These statements were rebutted by Counsel for the Company. At the close of the inquiry, Major Marindin said he would report to the Board of Trade in due course.

EXTENSION OF THE DUBLIN CORPORATION WATER-WORKS.

In the JOURNAL for the 5th inst., we reported the proceedings at an inquiry held on the 21st ult., by Mr. C. P. Cotton, the Engineering Inspector of the Local Government Board for Ireland, in regard to an application by the Dublin Corporation for power to take lands compulsorily for the extension of their water-works by the construction of an additional reservoir at Roundwood. It may be remembered that, in the course of the proceedings on that occasion, an application was made for an adjournment, on behalf of the Ratepayers' Association, who complained that they had not had an opportunity of being represented by Counsel, as they understood the inquiry had been abandoned. The Inspector said he could not adjourn without the consent of the Corporation; and the proceedings were continued, and eventually brought to a close. He, however, was directed to reopen the inquiry for the purpose of hearing further objections; and this he did a few days ago. Mr. R. P. Carton, Q.C., represented the Corporation; Mr. M. Kehoe, Q.C., appeared for the Ratepayers' Association. This gentleman stated that the Association did not controvert the position taken up by the Corporation that there ought to be a sufficient supply of water for the city and townships, but they contended that the present proposal was unnecessary. He called the City Engineer (Mr. Spencer Harty), who, in reply to questions, stated that at present there were 2745 million gallons of water available at Roundwood. At Stillorgan there were 160 million gallons, of which about half were in the Gray reservoir. This was not filled in 1893; it was now filled, but had been practically empty for about three years. This gave 80 million gallons more available now than in 1893. In 1894, for a portion of the time, 10½ million gallons per day were used. This followed a great effort to stop waste. The population supplied with Vartry water was about 340,000. The townships received by Act of Parliament 20 gallons per head. It was proposed to increase this to 25 gallons. He thought this sufficient for the townships, but not for the city. The meter supply in Dublin was about 7 gallons per head per day—that was for breweries and distilleries, who also took canal water. From the two canals, practically 4 million gallons of water a day could be obtained, of which 3 millions would be from the Grand Canal. The fifth lock canal supply was what they had for the breweries and distilleries; and they had had a connection between this supply and the Vartry for more than 25 years. In 1893, they obtained a loan of the eighth lock from the Rathmines Commissioners; and the connection with the lock was still in existence. They paid the Canal Company ¾d. per 1000 gallons. A sum of £4500 was paid for the eighth lock supply; and the connection with the Royal Canal cost about £6200. He did not think that in 1893 it was put forward that this expenditure of £10,700 was to prevent the extension of the water-works to meet any future emergency. They were now delivering nearly 500,000 gallons of canal water to one of the distilleries. The cost of the Roundwood water was 2½d. per 1000 gallons. Mr Kehoe remarked that, if the emergency arose, and the Corporation got the water for ¾d. per 1000 gallons from the Canal Company, they would be doing very well; but witness said this was not a fair way of looking at it. With the canal water they had 100 feet less pressure; and this was a difficult thing to deal with. Witness's attention was called to the fact that a calculation had been made which gave the total of the drought flow, the flow of the catchment area, and the contents of the Stillorgan and Roundwood reservoirs, as 3277 million gallons; and it was pointed out that, taking 271 days at 25 gallons for 340,000 people over the whole area, and adding 7 gallons a day for 245,000 as the city population, this gave 2768 million gallons, which would leave 500 million gallons roughly. He said the townships had never kept themselves down to this; and, in addition to the 25 gallons per head in Dublin, there was also a large quantity of water used for sanitary and other purposes, apart from the 7 gallons for trade. The sum of £10,100 a year was received from the townships; and if they were compelled to pay for their excess water, it would be £15,000. In reply to Mr. Shanks, a member of the Corporation, witness stated that in 1893 the drought lasted 271 days; in 1887, 240 days; and in 1884, it was 211 days. From October to December, 1893, the breweries and distilleries were left practically without a supply of water. The consumption in 1894 fell to an average of 11·33 million gallons a day. Some days it was down to 10½ millions; but they could not keep it to this. The saving was due to a reduction of waste, but not to a reduction in leakage. The townships took less water also. Witness was examined in reference to English towns where the Deacon waste-meter system is in use. Mr. L. L. Macassey repeated the evidence previously given by him as to Belfast. In reply to Mr. Kehoe, he said he thought Mr. Harty's estimate of 25 gallons per head per day a limited one. The expenditure of £56,000 on the extension, &c., proposed would cost about £3000 a year; and a general system of waste prevention by inspectors would come to nearly as much, and they would burden the householders, in addition, with the cost of new fittings and the repairing of defective ones. Mr. R. J. Cruise said he considered 25 gallons per head a sufficient supply for Dublin. Mr. Kehoe then addressed the Inspector. He said the Legislature had laid down 20 gallons per head per day as a proper supply; and the Corporation were not now to be listened to, saying that because they were using more water than was necessary, therefore provision should be made for an increased water supply. The canal supply could not be counted twice, as Mr. Harty had been trying to do. He had counted it in as the 7 gallons per head per day; and therefore that left free the entire 4 millions in addition to the 32 gallons per head per day. On the showing of the Corporation, they required 25 gallons a day for domestic purposes all over the area of supply, and 7 gallons a day additional for the Dublin urban population for trade purposes. This amount for 271 days of supposed drought would be 2768 million gallons; while, on their own showing, they had at present available at Roundwood 3277 million gallons, or a surplus of 509 million gallons, so that this additional reservoir was quite unnecessary. Mr. Carton remarked that, in this calculation of 32 gallons, Mr. Kehoe had left out of account that 20 per cent. extra was given during four months to the outlying townships; and he omitted water used for other than domestic or trade purposes—that was, for sanitary purposes. They must also recollect that the Corporation could not use the canal water without the consent of the brewery and distillery owners. The inquiry then closed.

Gas Explosion at Sheerness.—At noon on Monday last week, a serious gas explosion occurred at the office of the Police Inspector at the Dockyard Gate, Blue Town, Sheerness. The building was completely wrecked. It appears that recently some old gas-mains had been taken up and new ones laid, in order to improve the general supply to the dockyard. After the completion of the work, a strong smell of gas was perceived; but it was suggested that this did not arise from an escape, but from the old pipes which were stacked close by. If the explosion had happened a minute later, the dockyard workmen would have been passing the place on their way to dinner, and serious injury might have resulted; but happily no one was hurt.

The Dublin Corporation Gas Committee and their Inspector.—The Dublin Corporation seem at last to have come to a determination in regard to the attendance of the Lighting Inspector (Mr. T. J. Cotton) at the meetings of the Gas Committee. This matter was referred to in the JOURNAL for the 26th ult. (p. 445). At the meeting of the Corporation on Monday last week, the question was again brought forward by Mr. Buckley, who enumerated at length Mr. Cotton's duties, and moved—"That the resolution of the Council directing the Committee to act in accordance with the Solicitor-General's opinion that the Inspector was not entitled to attend the Committee's meetings be rescinded; and that the Council consider that, from the nature of his duties, it is the duty of the Inspector to be present." A long discussion ensued, in the course of which Sir R. Sexton, in opposing the motion, said he did not object to Mr. Cotton personally, and did not wish to exclude him when his presence was desirable; but he objected to him being always present as a matter of right, just the same as if he were a member of the Committee. Mr. Clancy moved, as an amendment, that the Committee were justified in having the Inspector present at the request of any member. After some discussion, this was agreed to.

The Opposition to the Bridlington Water Bill.—On Monday of last week, a special meeting of the Bridlington Urban Council was held to consider an offer by the Water Company as to the purchase of their works by the Council. The Company offered to put in their Bill the various clauses suggested by the Council, and also to enter into an agreement that, providing the Council wish to purchase the works within five years, the Company will sell without asking for the enhanced value the Bill now being promoted would give them—the cost the Company had been put to in obtaining the Act to be added to the purchase-money. The purchase was to be by arbitration; and the Council were to pay 10 per cent. for compulsory purchase. The Water Bill Committee said they had carefully considered these terms; and they recommended the Council to adopt them, on condition that the Company would accept 5 per cent., instead of 10 per cent., for compulsory purchase. The Council discussed the question for several hours; and eventually the Committee's recommendations were rejected by four votes to three. It was then agreed—"That the Water-Works Bill Committee of the Council have power to take all necessary steps to carry out the opposition to the Water Company's Bill, with freedom to act on the advice of the Parliamentary Agents and Counsel."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

An inquiry was opened by Sheriff Cheyne, as Sheriff of Renfrew, at Greenock, on Monday, as to the right of the Gourock Gas Commissioners to place a new gasholder on the north-east side of Royal Street. The inquiry was at the instance of the Gas Commissioners, who had not obtained the consent of the owner and occupier of every dwelling-house within 300 yards of the proposed site of the holder, and who were then bound to ask the Sheriff of the county to determine whether it could be erected without consent. Mr. Glen, the Town Clerk, put in a plan of the town, showing the proposed site, and said that all they could that day determine was as to the procedure. Mr. R. S. Murray, writer, who appeared for owners of property in the vicinity opposing the petition, was asked by the Sheriff to state his objections. This, Mr. Murray said, he was not prepared to do, as he had not had an interview with all the objectors. They, however, contended that the holder would be a nuisance, considering that it would be situated in a quadrangle, with dwelling-houses on all sides of it; and they would be prepared to point out where accommodation could be had elsewhere, without disturbing the amenities of the neighbourhood. The Sheriff directed the objections to be lodged in writing by to-day; and gave Mr. Glen four days thereafter to answer them. After this, the papers will be sent to him; and he will appoint a day for hearing evidence, in connection with which a personal inspection of the place might be made. As these proceedings are the first of the kind since this method of inquiry before the Sheriff was authorized, it will be of interest to see how the question is handled. If the objectors put forward nothing more than sentimental reasons, it is not likely the Sheriff will give much heed to them. To bring forward scientific evidence in support of the plea of nuisance, would open a wide field; and as the Sheriff has power to make an award of expenses, it is doubtful if the objectors will feel justified in incurring the risk of being cast in costs.

The Falkirk Gas Commissioners are beginning to find that, in the matter of gas supply, promises before taking office and giving satisfaction afterwards, are two different things. At their meeting on Monday, one of the members stated that he had received a letter from the secretary of a municipal committee complaining that the gas had been worse since the town acquired the undertaking than it was before; and, further, that many people in the writer's part of the town had had no gas at all. Of course, the Gas Commissioners were in no way to blame for either of the troubles complained of; it was the frost. But the incident must have brought home to the minds of the Commissioners the great difference there is between irresponsibility and responsibility in such matters. But a few months ago, some of them were in the ranks of the denouncers; now they are themselves the denounced for not giving good gas. It is very foolish that such things should be done; but it is an almost universal experience, and the Commissioners may expect more grumbling. I am not sure but that there may be a slight shade of reason in grumbling at their action, though not in connection with the quality of the gas they are supplying. As I stated last week, the Works Committee of the Commission had been visiting gas-works in other places; and the Manager had recommended the adoption of the Peebles oil-gas process, and Hislop's regenerative settings. The Works Committee, however, after their inquiries, were nonplussed; and they resolved that, before adopting the recommendations, they should go farther afield, and see what is being done. The introduction of the regenerative system of firing, they estimated, would cost £3000; and the oil-gas process, from £500 to £600. What put the members of the Works Committee in confusion was that, while at Perth and Alloa they were assured that the oil-gas process was a great success, when they turned to Hamilton and Coatbridge they were told that there they preferred to use coal only. The Committee were unable to make up their minds between the conflicting opinions. How should they? They are not experts, and cannot be expected to be able to decide technical questions. If they thought it was necessary to improve their works, they might first have had a report from their Manager on the subject; but better than that, it would have been more seemly, after the heavy expenditure they have had, to have held over consideration of the subject of improvements till they had had some opportunity of forming an opinion as to what the works were capable of doing. The Commissioners are, however, bent on at least making a show of work; and they gave the Committee power to prosecute their inquiries. More excursions are apparently contemplated; and in this connection, the question arises as to what is the difference between spending profits in defraying the expenses of Works Committee deputations and in paying Directors' fees.

The Dunfermline Police Commissioners, I am almost disposed to conclude, from the persistence with which they stick to the question of the price and quality of the gas supplied by the Dunfermline Gas Company, must be contemplating a movement for the taking over of the Company's undertaking. Several years ago, the agitation began with reference to the price charged by the Company for gas consumed in the public lamps. That seemed to have been settled, though I am not aware that the agitating Commissioners were ever able to say that they had gained anything by their action. The rancorous spirit which then possessed some of the Commissioners has broken out again over the price and quality of the gas supplied to the community. What mandate the Commissioners have to speak for the community is, of course, derived from statute; and I would like to know within the four corners of what statute they find powers to bind traders, public or private, as to the price or quality of the goods they sell to the community, apart from their surveillance of unsound food. Yet they are angry because the Gas Company will not agree to a conference with them on the question of price and quality. The Gas Company have offered to confer with regard to the gas supply to the public lamps, and also with reference to the provision for testing the quality of the gas sent out by them. That offer, conveyed by letter addressed by Mr. Pooley, the Secretary to the Gas Company, to the Town Clerk, it was regretted did not touch the main question which had been raised; and though the Town Clerk informed them that they had no power to compel the Gas Company, the Commissioners sent Mr. Pooley's letter to the Lighting Committee for consideration. In view of the Commissioners' want of power, I see no reason for the present movement, unless it be the precursor to a proposal for a transfer.

The Brechin Police Commissioners, having agreed with the Scottish House-to-House Electric Light Company for the latter obtaining a Provisional Order for the supply of electricity in the town, are exercised over a communication which has reached them from the agents of the Company in London, to the effect that unless the agreement be modified the Provisional Order is likely to be refused. It is pointed out that the Board of Trade are not likely to assent to the condition in the agreement which provides that the Corporation are to share in the profits. I should say the clause might be left in, for it will be altogether inoperative in Brechin. Objection to it can only be because it might form a precedent. But what if the Police Commissioners agree to strike out the clause, in order to let the Company get their Order? It was possible by its means, or largely so, that the Company successfully angled for the agreement with the Commissioners. With the clause kept in, the Order is likely to be lost; with it struck out, the Commissioners may fancy that the Order would be a worse arrangement than if they had promoted one for their own benefit. To allow the Order to be refused would mean the loss of all the initial expenditure; and upon whom would that fall? It is easy to see that the Commissioners are in a difficulty. Another clause, which may also have been an angling one, provides for the supply of electric light at a cost 25 per cent. under the price of gas in Brechin. The London Agents consider that is a remarkable clause, and think the Board of Trade will not pass the Order unless it be struck out. It is curious that the remarkable nature of this clause was not discovered until now. If it is struck out, the Company may charge what they like for current. A Committee of the Commissioners are to consider the subject.

It is announced that the Electric Lighting Committee of the Edinburgh Town Council have provisionally fixed Wednesday, April 10, as the date for the inauguration of the installation which they are putting down under their Provisional Order of 1891. A motion which originated in the Town Council, for a remit to consider what steps (if any) should be taken to secure that any faults in gas-mains and service-pipes shall be detected and removed without delay, and to provide against any dangers likely to result from insufficient piping in connection with the introduction of electric lighting into the city, has been sent to the Electric Lighting Committee for a report on the whole subject.

There is a proposal, following the agreement between the Scotch oil companies and the Standard Oil Company of America, to advance the price of oil by ½d. per gallon. That is about 10s. per ton; and, of course, such an increase would most seriously affect the prospects of manufacturers of gas from oil. Oil stocks in America have decreased within the past four years from about 36 to 40 million barrels, to about 5 million barrels, which is the explanation of the complaisance of the Standard Oil Company in the recent negotiations with the Scotch companies. In other words, the Standard Oil Company merely gave away what they had not the power to prevent the Scotch producers taking for themselves.

It is stated that the sanitary authorities in Glasgow are to take action against the proprietors and factors who cut off water supplies from tenants' houses during the recent frost and have done nothing to restore the supply. In populous districts, the withdrawal of the water supply has led to the formation of great nuisances, which it is feared may prejudicially affect the health of the community.

The water supply to the town of Hamilton having become discoloured, bitter to taste, and offensive to smell, a sample of it has been analyzed by Dr. Tatlock, of Glasgow, who has certified that the contamination has a vegetable origin, and is due to the late exceptionally severe weather. It is, Dr. Tatlock says, altogether harmless, and will pass away when the effects of the frost disappear.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 16.

Sulphate of Ammonia.—This has been a rather disappointing market; the usual spring orders from consuming quarters not having been forthcoming so far. Some sellers have been quietly accepting prices under the quotations current in the open market, and have thus been playing into the hands of dealers, who continue to work for a lower basis. Consequently values are quoted at a decline on last week. The position of nitrate is not a favourable one; the deliveries having been much short of what they were last year. There is therefore a large quantity to be dealt with up to the end of April. The uncertainty of this commodity is probably the cause of sulphate buyers being so tardy with their orders; and until the position is more clearly defined, there will be an irregular market. The quotations to-day are £10 17s. 6d. to £11. Nitrate on spot is still quoted 9s. per cwt., although at Continental ports, with more plentiful supplies, values have somewhat receded.

LONDON, *March* 16.

Tar Products.—A steady business is being done in benzols and pitch, without any important change in values. Creosote is dull, and solvent naphtha is also in over-production at the moment, although a better demand for this article may be expected very shortly. Carbolic acid is firm; and cresylic acid is a little more inquired for. Anthracene is said to be worth the full prices asked by the Tar Sales Committee; but actual transactions are not publicly noted. Prices are as follows: Tar, 18s. to 21s. 6d. Benzols, 50's and 90's, 1s. 0½d.; Solvent naphtha, nominal, 1s. 1d. Toluol, 1s. 3d. Crude, 30 per cent., naphtha, 4½d. Creosote liquid, 2d.; ordinary, 1⅜d.; salts, 20s. Cresylic acid, nominal, 1s. Carbolic acid, 60's, 1s. 6½d. Anthracene, "A," 1s. 1d.; "B," 10½d.

Sulphate of Ammonia does not improve as had been expected by the advent of more seasonable weather. Stocks, however, in makers' hands are said to be comparatively low; and the home consumption will now be very considerable for the next few months. This points to more activity, and possibly of better value. Very little new business is reported; and quotations have varied between £10 17s. 6d. country ports, and £11 2s. 6d. London, less 3½ per cent. Gas liquor is quoted at 7s. 6d. to 9s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—In the coal trade here, the demand generally shows less activity; while prices, though in most cases without quotable change, are if anything rather easier. Pits as a rule are again getting on to short time—generally about four days per week. The milder weather necessarily tends to diminish the demand for the better qualities of round coal for house-fire purposes. But a moderate weight of business is still reported in these descriptions of fuel; and practically nothing is as yet going into stock. The lower qualities of round coal are again hanging upon the market, owing to lessened requirements for domestic and manufacturing purposes, with prices irregular. Engine classes of fuel are not moving off so readily; and supplies are becoming plentiful, with some low cutting in prices to clear away surplus lots. At the pit mouth, best Wigan Arley coals are in some cases still quoted at 11s. per ton, though 10s. 6d. is becoming more nearly the average figure; Pemberton four-feet and seconds Arley range from 8s. 6d. up to 9s. 6d., with common qualities at 7s. up to 8s.; steam and forge coals may be said to average about 6s. 6d. for ordinary descriptions; and common engine fuel is readily obtainable at 3s. 6d. and 4s., with good ordinary sorts at 4s. 6d., and some of the better qualities quoted at 4s. 9d. up to 5s. 3d. Only a limited weight of business is reported in the shipping trade; and to secure orders extremely low prices are taken. For delivery at the ports on the Mersey, 8s. to 8s. 3d. is quoted for the better qualities of steam coal; but for some of the inferior descriptions, 7s. 6d. would be taken.

Northern Coal Trade.—The northern coal trade has been affected by the uncertainty that has prevailed as to the continuance of work in another of the great coal-fields, which has caused buyers abroad to order more freely, and sellers here to ask higher prices. But at the same time, these buyers are disinclined to pay higher rates. Best Northumbrian steam coal is quoted at 9s. per ton f.o.b. for delivery over this month; but for delivery into next month and over the spring and summer, up to 10s. is asked, though not yet paid. Steam smalls are not so plentiful, but are still to be had at 3s. to 3s. 3d. per ton f.o.b. for early delivery; whilst for forward delivery the prices vary so greatly that quotation is undesirable. In regard to gas coal, there is not quite so full an inquiry as there was; but it is considerably above that usual at this time of the year, and gives fair measure of activity to some at least of the collieries. The price for best Durham gas coals varies from 6s. 9d. to 7s. 6d. per ton f.o.b.; and contracts that are now being daily made for quantities for shipment are on bases that are similar. There is also still a large consumption for gas for local companies. The coke trade is experiencing a rather better demand for the north-west; but it is still below the normal needs. The price varies from 13s. to 13s. 6d. per ton f.o.b. Gas coke continues in steady demand—the exports being heavy enough to keep down the stocks; and the output is now lessening. There is no alteration in the price of gas coke. Fuel, however, of all kinds will be much affected by whatever settlement or decision may be come to in South Wales before the end of the month.

Scotch Coal Trade.—The attitude of the coalowners, who are waiting to see the development in Wales, and are unwilling to make any forward contracts in the hope of a rise in the market, continues. Some provisional contracts have, however, been entered into, at easy rates, with English buyers, to cover the contingency of a stoppage in Wales. The home demand is not improving; but shipping contracts are looking better for coalowners, and are expected to improve soon, when the Baltic ports open. Prices are quoted at: Main, 6s. to 6s. 3d. per ton f.o.b. Glasgow; ell, 7s.; splint, 6s. 6d. to 6s. 9d.; and steam, 7s. 9d. to 8s. The shipments for the week amounted to 95,765 tons—a decrease on the preceding week of 7763 tons, and as compared with the corresponding week of last year of 17,726 tons. For the year to date, the total shipments have amounted to 965,696 tons—a decrease as compared with the same period of last year of 301,933 tons, but an increase of 689 tons over the corresponding period of 1893.

The Dewsbury and Heckmondwike Water Bill.—At a meeting of the Dewsbury Town Council on Tuesday last, it was stated that 22 petitions had been lodged against the Dewsbury and Heckmondwike Water-Works Bill in the House of Lords; also that the Clerk to the Heckmondwike District Council had written to the effect that the Council refused to enter into negotiations for the sale of any portion of their share in the water undertaking unless the present Water Bill was withdrawn.

A Large Batch of Unpaid Gas Accounts.—A paragraph which lately appeared in a local paper, bears testimony to a strange antipathy on the part of a large number of the people of Huddersfield to pay what is due from them. The paragraph stated that, at the Borough Police Court last Friday week, no fewer than 164 summonses for non-payment of gas accounts owing to the Corporation came before the Court. In some cases settlements had been arrived at between the parties concerned and the Corporation collector; and in the others, the Magistrates made orders for payment of the amounts owing. On the same occasion, 359 persons living in Huddersfield, and 70 persons residing in the Dalton township, were summoned for having failed to pay the poor-rates; and it is understood that these are but an instalment of the number it may be necessary to proceed against.

Narrow Escape of a Gas Manager.—At Keswick last Tuesday, the Gas Company's Manager (Mr. T. Heywood) and two men named Hunter and Hardisty met with a dangerous accident, while cleaning a large meter which supplies the railway station, and which is placed in a vault about 9 feet long by 6 feet wide. Mr. Heywood and the men had not been in the vault more than about five minutes when gas escaping from the disconnected pipes overpowered them. Hardisty managed to scramble through the manhole with assistance; and Hunter, who was rescued in a bad condition, had to be taken home. Mr. Heywood was found lying unconscious in a corner of the vault, and ropes had to be used before he could be extricated. He was taken home on a stretcher; and some time elapsed before he could be brought round. Happily all three eventually recovered, though Mr. Heywood complained afterwards of a bad headache and sickness.

Suggested Lowering of the Standard of Liverpool Gas.—At last week's meeting of the Special Lighting Committee of the Liverpool Corporation, the question of the gas supply to the public lamps was discussed; and it was decided, in view of the improvements which have been introduced of late years into the illuminating power by means of modern burners, to request the Gas Company to reduce the candle power of their gas from the present standard of 20 candles to about 16 candles. It was stated that this could be done without interfering with the efficiency of the supply; while a substantial saving would be effected.

The Scarborough Gas Bill.—An extraordinary meeting of the Scarborough Gas Company was held last Tuesday, to consider the various amendments in the Company's Bill now before Parliament, agreed to at a conference between the representatives of the Company and the Corporation. The Chairman (Mr. B. Fowler) said the most important of the clauses were: (1) That the Corporation have power to purchase the undertaking within a period of three years, and no longer, the terms to be settled by arbitration subject to the Land Clauses Act, and to be treated as compulsory purchase; (2) that the new 5 per cent. gas stock should be redeemable at its issue prices. The Chairman moved, and Mr. F. Ness seconded, the adoption of the amendments; and they were unanimously carried without discussion—one of the shareholders remarking that, although the Company had not obtained everything they wanted, it was a very good Bill.

Supplementary Supply of Water for Portrush.—On the 6th inst., Mr. C. P. Cotton, the Chief Engineering Inspector of the Local Government Board for Ireland, inquired into an application by the Rural Sanitary Authority for a loan of £2000 from the Board of Works, for the purpose of improving the water supply of Portrush. The evidence of the Engineer (Mr. A. D. Williamson) showed that the present catchment area is 300 acres in extent; and in this there are several springs on the higher levels, which fall into the open channel supplying the town. At present the stream is liable to pollution from farmyards in wet weather; and it is proposed to put an intake into the stream so as to catch the pure water from the springs, and lead it direct to the reservoir, or take it into the mains and through the filter-bed, or convey it direct to Portrush. The supply will be sufficient for a population of 5000 during the summer season. The scheme also provides for the enlargement of the reservoir. There was no opposition.

The Tees-Side Water Supply during the Recent Frost.—At the meeting yesterday week of the Stockton and Middlesbrough Water Board, the General Manager (Mr. D. D. Wilson) reported, with respect to the pumping and distribution of water during the recent frost, that for the week ending Feb. 16 the quantity of water distributed in the district was the greatest on record—viz., 85,854,000 gallons, which was used as follows: Meter consumption, 43,621,000 gallons; domestic and waste, 42,233,000 gallons. During the five weeks ending March 2, the domestic consumption and waste amounted to 139,766,000 gallons, or an average of 27,953,000 gallons per week, compared with 77,541,000 gallons, or an average of 15,508,000 gallons per week during the corresponding weeks of last year. The enormous quantity of water wasted to some extent interfered with the meter supplies, but only in cases where the water was required to be delivered at a considerable elevation, or where the pipes from the delivery side of the meters were only equal to the supply under very favourable circumstances. During the five weeks, the quantity of water supplied by meter was 232,414,000 gallons, or an average of 46,483,000 gallons per week, as compared with 237,973,000 gallons, or 47,595,000 gallons per week during the corresponding weeks of last year. During the quarter ending Feb. 14, the meter supply was 45,952,000 gallons per week; and during the whole of 1894, 46,826,000 gallons per week. There had been very few cases of frozen or broken mains; and these had been confined to small-sized pipes. The number of burst pipes reported to date was nearly 3000; and fresh reports were coming to hand hourly. Although great care was taken to protect meters when in use, in 75 cases they had been burst by the frost, chiefly in small supplies, where no water was being used on the first Sunday of the frost. At no time was there any difficulty in keeping up the supply, and fortunately no necessity for cutting off the water during the night, as had been the case in many districts.

Leeds Corporation Water-Works.—At the last monthly meeting of the Leeds Corporation Water Committee, a report was submitted from Mr. G. Hill as to the work of reconstruction at the Eccup reservoir. Mr. Hill stated that he had visited the trench, and examined the bottom of the reservoir; and he approved of what had been done. He agreed with the City Engineer (Mr. T. Hewson) that the repuddling of the deepened portion of the trench might now safely be commenced; and a proposal that brick side screen walls should be built on the reservoir and departure side of the trench to protect the foot of the puddle was also approved. Mr. Hill's report further informed the Committee that, as the trench had been making a considerable amount of water at the north end for some time past, it would be necessary to dig out a further length for some 80 yards. The total depth of the trench from the finished road level to the bottom was 170 feet; the length along the bottom, 420 feet; the width at the widest part at the top, 26 feet; while the average width of the deepened portion through the shale was 9 feet, and the average depth of shale taken out below the old trench was 39 feet. With regard to other matters, it was reported that the 32-inch Washburn pipe-line from Arthington to the Swinsty reservoir had now been laid for a distance of 5 miles 280 yards out of a total of about 8 miles. The slip on the north-easterly side of the Lindley Wood reservoir was also being repaired; and the construction of the retaining-wall had now been puddled sufficiently high to allow the reservoir to be filled to its greatest capacity. With reference to the question of water supply, it appeared that there was at present in the reservoirs 2580 million gallons, representing 102½ days' supply, as against 2538 million gallons, or 112 days' supply, this time last year. It would be observed that, although the quantity of water in store was greater, the length of time over which it was calculated to extend was less than was the case a year ago. This was due to the average consumption per day at present being greater than it was this time last year.

New Water-Works for Basingstoke.—The Basingstoke District Council have determined to apply to the Local Government Board for a loan of £16,000, in order to carry out a new scheme of water supply according to plans, &c., prepared by Mr. Rofe.

The Dublin Corporation Improvement Bill.—The *Freeman's Journal* last Friday stated that the Right Hon. the Lord Mayor and Corporation were, on the previous day, served with a writ, in connection with an action for an injunction to restrain the Municipal Council from proceeding further with the Improvement Bill.

Sheppy Gas Company.—At the annual general meeting of this Company last Wednesday, the Directors reported that, though the increase in the consumption of gas during the past year had not been large, the quantity sold reached very nearly 50 million cubic feet—the highest total yet shown. About 50 prepayment meters, with the necessary fittings, were put up during the year; and they worked satisfactorily. The balance of net profit was £1716; and the Directors recommended the declaration of the maximum dividends.

The Public Lighting of Ipswich.—With reference to the resolution which the Paving and Lighting Committee of the Ipswich Corporation passed at their meeting on the 1st inst., referred to last week, that notice be given to the Gas Company of the intention of the Committee to alter the arrangement under which no deduction is made for the first night a lamp is out, the Directors of the Company have intimated that they are quite prepared to accept the suggestions of the Paving and Lighting Committee, and to discuss with them any points which may arise.

The Gas and Water Profits of the Ramsgate Corporation.—An inquiry was held last Tuesday at Ramsgate, by Mr. E. P. Burd, one of the Local Government Board Inspectors, touching a proposal of the Town Council to alter the mode of dealing with the gas and water profits. At present, the gas profits benefit about equally the consumers and the ratepayers. By the proposed new arrangement, the price of gas, which is now nominally 3s. 2d. per 1000 cubic feet, will be reduced to 2s. 6d., or to such a sum as will cover the cost of production. There was no real opposition; and, from the remarks which were made by the Inspector, a favourable report is expected.

The Gaslight and Coke Company and the Supply of Stoves and Fittings.—The Birmingham correspondent of the *Ironmonger*, writing on the subject of the manufacture of gas cooking and heating appliances, in which he states that there is now great activity, says: "Considerable interest is being aroused by the gigantic scheme which has been set on foot by The Gaslight and Coke Company, of London, who are credited with an intention to expend not less than £2,000,000 in the development of their undertaking. The Company, it is understood, propose to get the assent of householders to fix not only gas-brackets in their premises, but a cooking-stove and a penny-in-the-slot meter; the cost of these, with the fittings, being estimated at £8 or £9 per tenement. No charge will be made for them, nor will there be any rent to pay. All the Company ask is that they should be allowed to fix these articles in the house; they being sanguine that when once the tenant uses them he will continue to do so. The gas-cookers will be placed in the class of houses ranging from a weekly rent of 5s. and 6s. upwards."

Exhibition of Gas Appliances at Easingwold.—On Monday evening last week, Mr. C. Sellers, the Engineer and Secretary of the York Gas Company, delivered an instructive address when performing the opening ceremony in connection with an exhibition of gas appliances held by the Easingwold Gas Company in the Town Hall. The cooking and heating stoves were furnished by Messrs. C. Wilson and Son, of Leeds. Mr. Sellers dwelt upon the value of gas-stoves for culinary purposes, and emphasized the importance to ladies of acquiring a knowledge of scientific gas cooking. He said that health, comfort, economy, and, above all, good temper, depended upon it; for nothing soured the temper more than ill-cooked food. In York, there were 1100 or 1200 gas-cookers fixed, and when a lady became accustomed to one of these appliances, she very rarely gave it up. He advocated gas-stoves for warming bedrooms, as the temperature could then be kept even. This was impossible with a coal fire, and, moreover, the gas saved the labour of carrying coal. He referred to the various uses to which gas was now put; and he then went on to explain the principle of the Welsbach burner, which he predicted would soon be so cheapened that it would come more and more into general use. He concluded with a few words of commendation for the appliances—cooking, heating, and lighting—exhibited, and received a hearty vote of thanks for his address.

The Opposition to the London County Council's Water Bills.—An important meeting, convened by the Surrey County Council, of all the local authorities concerned, was held in London last Thursday, when the following resolution was carried unanimously: "That this meeting approves of the policy of the Surrey County Council, as explained by their Chairman—viz., that strenuous opposition be offered to the London County Council's Lambeth and Southwark and Vauxhall Water-Works (Transfer) Bills, unless the transfer to the Surrey County Council of the sources of supply, filter-beds, mains, and other means of distribution necessary for the said Administrative County of Surrey be secured; and recommends the local authorities in the administrative county to support the action of the Council in Parliament in furtherance of such policy." Both the Kingston and Richmond Corporations were represented, as well as the Wimbledon, Surbiton, Ham, and Barnes Urban District Councils, the Croydon and Epsom Rural District Councils, and the Parish Councils of Mitcham, Thames Ditton, and Merton. At a special meeting of the Wandsworth District Board of Works last Wednesday, a report was received from the General Purposes Committee, recommending that a petition be presented to Parliament against the above-named Bills, and further that the Board should appear by Counsel before the Parliamentary Committee in opposition thereto, and in support of the views of the Board in the matter, urging the creation of a Water Trust. Mr. Lidiard moved the adoption of the recommendation, and observed that all were agreed that the water supply of the Metropolis should be in the hands of some public body, but not the County Council. The recommendation was adopted.

The Merthyr Tydfil Water Bill.—The Merthyr Tydfil District Council have resolved, by five votes to two, to omit clause 20 from their Bill, on the ground that the scale of charges therein contained is inequitable to cottage owners and occupiers, and consequently to the undue advantage of proprietors of the large works in the district.

The Water Supply of Penrith.—In compliance with the wish of the Local Government Board, Mr. G. F. Deacon has prepared a scheme for bringing water to Penrith from the Melmerby Fells. His estimate of the cost is £15,914; but he advises the District Council to seek powers to borrow at least £17,000 in the event of the scheme being adopted.

Stratton and Bude Water Supply.—An inquiry was recently held by Mr. W. J. B. Clerk, an Inspector of the Local Government Board, respecting an application by the Stratton Sanitary Authority for power to borrow £6700 for furnishing a supply of water to Stratton and Bude. Mr. Anson presented plans and estimates of the proposed scheme; and the Clerk (Mr. Rowe) read the terms of the suggested agreement with Mr. Thynne, the landowner. Several ratepayers objected to the terms of the agreement—a rental of 1s. per acre and £1 per mile of easements—as too high; and it was suggested that only agricultural value should be charged, as Mr. Thynne was bringing water from one part of his property to another. Canon Thynne said his brother was anxious that water should be brought to Bude; and if the Inspector considered the terms too high, his brother would modify them. Mr. J. S. Cottle, another landowner through whose property the proposed pipe-line will run, also expressed his willingness to agree to reasonable terms; while Dr. King said he would accept a nominal rent for the land required for a service reservoir. The population of Stratton was stated to be 823, and that of Bude 1054, with about 2000 addition to the latter in the season. In reply to a question, the Inspector said 20 gallons of water per head per day was sufficient supply, if properly managed. It was suggested, on behalf of the Sanitary Authority, that the period allowed for the repayment of the loan should be 40 years; but the Inspector expressed the opinion that the Local Government Board would not grant more than 30 years.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 585.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Oct.	10½	Alliance & Dublin 10 p. c.	10	21—22	..	4 15 6
100,000	10	,,	7½	Do. 7 p. c.	10	14—15	..	5 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
200,000	5	14 Nov.	6½	Bombay, Limited	5	6¼—6¾	..	4 16 5
40,000	5	,,	6½	Do. New	4	4¾—5	..	5 4 0
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	243—248	..	4 12 8
180,000	,,	,,	8½	Do. New	100	195—200	..	4 5 0
220,000	Stck.	14 Mar.	11	Brighton & Hove Original	100	220-225*	..	4 17 9
888,500	Stck.	28 Feb.	5	Bristol	100	115—117	..	4 5 6
320,000	20	28 Sept.	11½	British	20	50½—51½	..	4 7 3
50,000	10	14 Mar.	11½	Bromley, Ordinary 10 p. c.	10	21—22*	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	16—17*	..	5 0 0
328,750	10	14 Nov.	2	Buenos Ayres (New) Limited	10	6—6½	..	3 1 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	..	5 16 7
150,000	20	28 Feb.	8½	Cagliari, Limited	20	26½—27½	..	6 0 0
550,000	Stck.	11 Oct.	13½	Commercial, Old Stock	100	287—292	..	4 12 5
165,000	,,	,,	10½	Do. New do.	100	215—220	..	4 15 5
160,762	,,	13 Dec.	4½	Do. 4½ p. c. Deb. do.	100	130—135	..	3 6 8
800,000	Stck.	13 Dec.	13	Continental Union, Limited.	100	247—252	..	5 3 2
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	205—210	..	4 15 3
535,000	Stck.	28 Feb.	5½	Crystal Palace Ord. 5 p. c. Stk	100	118—123	+3	4 5 4
486,090	10	31 Jan.	11	European, Limited	10	24—25	..	4 8 0
354,060	10	,,	11	Do. Partly paid	7½	16½—17½	..	4 14 3
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	263—266	..	4 10 2
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105—110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c.Pf.	100	275—280	..	3 11 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	197—202	..	3 14 3
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	183—188	..	3 14 6
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	275—280	..	3 11 5
476,000	,,	,,	6	Do. K, 6 p. c. Prf..	100	163—168	..	3 11 5
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140—145	..	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	188—192	..	3 2 6
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	237—240	+1	5 0 0
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd.	5	5¾—6¼	..	4 16 0
560,000	100	1 Oct.	5	Met.of Melbourne, 5 p.c. Deb.	100	111—113	..	4 8 6
541,920	20	14 Nov.	5	Monte Video, Limited	20	15½—16½	..	6 1 2
150,000	5	29 Nov.	8	Oriental, Limited	5	7—7⅛	..	5 6 8
60,000	5	13 Sept.	7	Ottoman, Limited	5	4¼—5	+¼	7 0 0
166,870	10	14 Feb.	2	Para, Limited	10	1½—2½	..	8 0 0
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	105—109	..	5 10 1
500,000	100	1 Dec.	6	2nd Do.	100	102—107	..	5 12 1
150,000	10	11 Oct.	6	San Paulo, Limited	10	8¼—9⅛	..	6 6 4
500,000	Stck.	14 Feb.	15½	South Metropolitan, A Stock	100	355—365	..	4 4 10
1,350,000	,,	,,	12	Do. B do.	100	293—298	..	4 0 7
290,000	,,	,,	13	Do. C do.	100	307—312	..	4 3 4
775,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	100	167—172	..	2 18 2
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	230—235	+5	4 17 10
				WATER COMPANIES.				
746,021	Stck.	28 Dec.	10⅜	Chelsea, Ordinary	100	283—288	—2	3 10 4
1,719,514	Stck.	11 Oct.	8	East London, Ordinary	100	223—228	—2	3 10 2
654,740	,,	28 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	147—152	..	2 19 2
700,000	50	13 Dec.	8½	Grand Junction	50	113—116	—2½	3 13 4
708,000	Stck.	14 Feb.	12	Kent	100	300—310	..	3 17 5
1,043,800	100	28 Dec.	9½	Lambeth, 10 p. c. max.	100	255—260	—5	3 13 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	205—210	..	3 11 5
330,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	130—135	..	2 19 3
500,000	100	14 Feb.	12¾	New River, New Shares	100	378—383	—2	3 6 6
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk.	100	140—143	..	2 15 11
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	157—162	..	3 14 1
126,500	100	,,	6	Do. D 7½ p.c. do.	100	151—157	..	3 16 5
1,155,066	Stck.	13 Dec.	10	West Middlesex	100	273—278	—2	3 12 0

*Ex div.

† Next dividend will be at this rate.

Sulphate of Ammonia Manufacture at Lincoln.—On the advice of their Gas Engineer (Mr. J. Carter), the Lincoln Corporation have sanctioned an expenditure not exceeding £900 for the erection of sulphate of ammonia plant.

Sales of Stock and Shares.—A quantity of stock and shares in the *Bristol Gas Company* and the *Reading Gas Company* were recently sold by Messrs. Alexander, Daniel, Selfe, and Co., at Bristol. Four lots of the first-named Company's general capital stock sold at £117 10s. per cent., and three at £117 15s. Three lots of fully-paid £10 shares, limited to 7 per cent., in the Reading Company, realized £15 2s. 6d. per share, and six lots £15; while £100 of 4 per cent. perpetual debenture stock produced £106.——In accordance with the announcement made in our advertisement columns on the 5th inst., Mr. Alfred Richards sold by auction, at the Mart, Tokenhouse Yard, E.C., last Tuesday, £20,000 of "C" stock of the *Tottenham and Edmonton Gas Company*. This is nominally a 7 per cent. stock; but the last dividend paid on this class was at the rate of 8¾ per cent. per annum. The prices realized ranged from £179 10s. down to £176 per £100 of stock; and the proceeds of the sale amounted to £35,497.——Last Thursday, Messrs. Waterman and Sons sold £150 of consolidated stock in the *Maidstone Gas Company*, paying 10¾ per cent., for £364.——Last Friday, fourteen original shares in the *Devonport Gas Company* were offered for sale by Mr. W. J. Lamb. Five realized £10 12s. 6d.; five, £10 16s.; and the remaining four, £10 17s.

Reduction in Price.—From the 1st of July next, the price of gas at Windsor will be 3s. 6d. per 1000 cubic feet; being a reduction of 2d. upon the present charge.

Curious Case of Suffocation by Gas.—That the common practice of leaving a small jet of gas alight during the night in bedrooms is not unaccompanied by danger has been demonstrated, in a deplorable manner, at Oldham. An elderly woman named Frances Smith, residing in the Featherstall Road North, retired to rest on the night of Saturday, the 2nd inst., with her grandson, aged five years. Nothing was seen of them on the two following days; and Mrs. Smith's sons, apprehending that something was wrong, visited her house on Monday evening. They found her bedroom door closed; and, on entering, they were almost overpowered by gas. The occupants were both unconscious. They were removed; and medical assistance obtained, and means taken to revive them. The woman, whose breathing was very faint, was ordered to the Infirmary, where she expired on the following Thursday morning. The child, a short time after being rescued, was able to speak; but the last report stated that he was in a critical condition. Mrs. Smith, it is said, was in the habit of keeping a small gas-jet alight during the night. When the room was entered, the tap was found turned on a little, and gas escaping; but how the flame became extinguished is not known. The deceased and her grandchild were in bed about 47 hours; and for a great portion of that time must have been inhaling gas.

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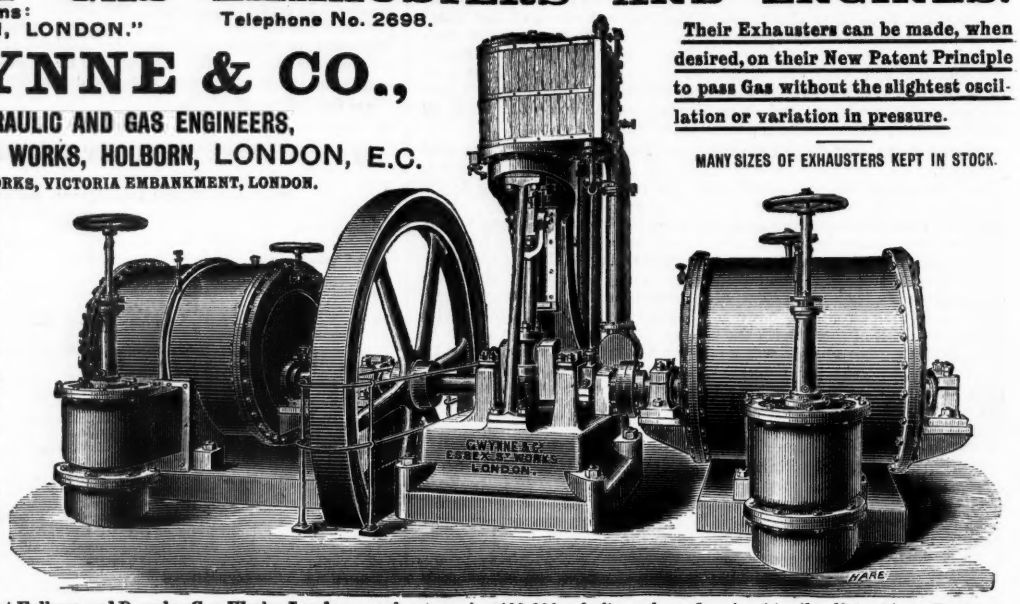

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*** See Advertisement p. 574 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

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Ventnor, Isle of Wight,
March, 1895.

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Applications, stating Age, and accompanied by not less than three Testimonials of recent date, and addressed to the Chairman of the Gas and Water Committee, and endorsed "Gas and Water Engineer," to be left at my Office, Church Street, Egremont, Cheshire, not later than Five o'clock in the Afternoon of Wednesday, the 3rd of April, 1895.
Canvassing members of the Council will be regarded as a disqualification.
By order,
W. DANGER,
Clerk to the Council.
Public Offices: Egremont, Cheshire,
March 14, 1895.

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Apply, by letter, stating Age and Wages required, with Reference, to No. 2503, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREMAN or Engineer wanted, to manage a Gas-Works on the Coast of Brazil. Must be thoroughly well qualified to superintend the Manufacture and Distribution of Gas. A knowledge of Water Supply would be advantageous. Salary £400 in gold, with a Residence.
Apply, with Testimonials, to A. F. PHILLIPS, C.E., 88, PARLIAMENT STREET, S.W.

GAS-EXHAUSTER Wanted, about 40,000 Cubic Feet per hour.
Address No. 2496, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Four Second-Hand Purifiers, 10 ft. or 12 ft. square, with Centre-Valve, or Valves and Connections, together with Covers, Grids, and Lifting Apparatus complete, in good sound condition.
State Price and Particulars to the undersigned.
GEORGE MOAT,
Manager.
Gas Office, Purston, Pontefract.

FOR SALE, cheap—One 20,000 cub. feet per hour Beale's EXHAUSTER, with two 8-inch Disc Valves. Also one to pass 5000 Cubic Feet per hour. Both in perfect condition.
Apply to SAMUEL WHILE, 60, Queen Victoria Street, LONDON, E.C.

THE Elmsall and South Kirby Gas Company invite TENDERS for the supply and erection of a single GASHOLDER, 45 feet diameter by 14 ft. 3 in. deep, with Wrought or Cast Iron Tank.
For Specification and Particulars, apply to Mr. Matt. Dunn, Engineer, Gas-Works, Selby, to whom sealed tenders are to be sent not later than the 29th of March, 1895.
The lowest or any tender not necessarily accepted.
By order,
CHARLES SCHOLEFIELD,
Proprietor.
Gas-Works, South Elmsall, *via* Doncaster.

THE URBAN DISTRICT COUNCIL OF PADIHAM.
(GAS DEPARTMENT.)

THE Gas Committee of the Urban District Council of Padiham invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR, to be produced at the Gas-Works, Padiham, during the Year ending March 31, 1896.
Sealed tenders, addressed to the Chairman, Gas Committee, District Council Offices, Padiham, must be sent to me not later than Saturday, March 23 inst.
For Particulars, apply to
J. R. SMITH,
Clerk to the District Council.
Padiham, March 8, 1895.

ULVERSTON URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the supply of B.O.V. during the Year ending the 25th of March, 1896.
The Acid to be made from Brimstone or Spent Oxide, and of a strength not less than 144°.
Forms of Tender and further Information may be had on application to the undersigned.
Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for B.O.V.," to be sent in not later than Thursday, the 28th inst.
The Committee do not bind themselves to accept the lowest or any tender.
JNO. SWAN,
Engineer and Manager.

HYDRAULIC MAINS.

ACCUMULATION of thick Tar entirely prevented. A great reduction in Stopped Ascension-Pipes by using CARPENTER'S PATENT HYDRAULIC MAIN CLEANER. No expense beyond first cost.
All Particulars on application to S. & H. W. CARPENTER, Vulcan Iron-Works, Rhodeswell Road, Limehouse, LONDON, E.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Ossett Gas Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR produced at their Works during the next Twelve Months.
The Liquor can be loaded into Tank-Waggons, at the Lancashire and Yorkshire Railway Siding, Healey, Ossett.
Liquor to be quoted for both by Twaddel's and Wills's Tests.
Tenders to be sent in not later than Wednesday, the 27th inst.
By order,
JAS. CASTLE,
Secretary.
Ossett, March 7, 1895.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Water Committee invite TENDERS for the surplus TAR (100,000 gallons or thereabouts) to be made between the 1st of April, 1895, and the 31st of March, 1896.
Tenders to be returned on or before Saturday, March 30, addressed to the Chairman of the Gas and Water Committee, Hardres Street, Ramsgate, and endorsed "Tender for Tar."
The Committee do not bind themselves to accept the highest or any tender.
Full Particulars on application to
WILLIAM A. VALON,
Engineer.

EDINBURGH AND LEITH CORPORATIONS GAS.

THE Commissioners invite Tenders to supply COALS, LIME, and GENERAL STORES (Pipes, Paint, Timber, &c.) required at their Works in Edinburgh and Leith during the Year from the 15th of May next.
The Contractors must guarantee that, in the execution of their contracts, they will pay the standard recognized rate of wages, or such wages as are generally accepted as fair in their trade.
Tender Forms and all Information can be had on application to the Engineers at the respective Works.
Offers must be lodged not later than Ten o'clock on Monday forenoon, 25th current, in sealed envelopes, addressed to the undersigned.
The Commissioners are not to be bound to accept the lowest or any tenders.
JAMES M'G. JACK,
Clerk.
25, Waterloo Place, Edinburgh,
March 12, 1895.

COUNTY BOROUGH OF BURNLEY.
(GAS DEPARTMENT.)

THE Corporation are prepared to receive TENDERS for the supply, for One, Two, or Three Years, of 2000 Tons of CANNEL per annum, and of such quantities of GAS COAL as may be required (approximately estimated at 45,000 tons per annum), to be delivered, in such quantities and at such times, as the Gas Engineer of the Corporation may from time to time order.
Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. J. P. Leather, Gas Engineer, Gas-Works, Burnley.
Tenders, which must be on the printed form and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Burnley, marked "Tender for Gas Coal," must be delivered not later than Wednesday, the 10th of April, 1895.
By order,
WM. T. FULLALOVE,
Town Clerk.
Town Hall, Burnley,
March 13, 1895.

SHEFFIELD UNITED GASLIGHT COMPANY.
GRIMESTHORPE STATION.

TO BUILDERS AND CONTRACTORS.

THE Directors of this Company invite TENDERS for the excavation and construction of CONCRETE and BRICK FOUNDATIONS for proposed new BUILDINGS, LIQUOR TANK, &c., at their Grimesthorpe Station, comprising about 9000 cube yards of Excavation, 5200 cube yards of Portland Cement Concrete, 490 cube yards of Brickwork, &c.
Drawings and Specification may be seen, and Bill of Quantities obtained, upon application to the Engineer, Mr. Fletcher W. Stevenson.
Sealed tenders, endorsed "Tender for Foundations," must be delivered to the undersigned (by post), at the Company's Offices, on or before Saturday, the 30th day of March.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
March 14, 1895.

BRIGHOUSE CORPORATION.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Gas Committee of the Brighouse Corporation are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works, for a term of One, Two, or Three Years from the 25th of March inst.

The quantity of Tar made is about 350 tons per annum; and there is storage capacity on the Works for about 250 tons. The Tar can be loaded into Contractors' Carts on the Works, or into Barges on the Calder and Hebble Canal (which runs alongside) by Pipe direct from the Works.

Any further Particulars can be obtained on application to the Gas Engineer.

Sealed tenders, endorsed on the outside "Tender for Tar," stating price per ton at the Gas-Works, must be sent in on or before Wednesday, the 27th day of March, 1895, addressed to the Town Clerk, Public Offices, Brighouse.

The Committee do not bind themselves to accept the highest or any tender.

By order,
JAMES PARKINSON,
Town Clerk.

Town Clerk's Office,
Brighouse, March 12, 1895.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office, on Wednesday, the 27th inst., at Half-past Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 16th, and REOPENED on the 28th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 8, 1895.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

CLAPHAM BROS., LIMITED, of Keighley, Yorks., beg to intimate that they are the SOLE MAKERS of LAYCOCK & CLAPHAM'S "ECLIPSE" WASHER-SCRUBBER, and that no person or persons beyond the Patentees and Makers have ever had any interest whatever in the Patent.

They are also the SOLE MAKERS of CLAPHAM'S PATENT IMPROVED "ECLIPSE" CONDENSER, as supplied to Bradford, Manchester, and other Gas-Works.

Orders and Inquiries promptly attended to. See Advertisement in this week's JOURNAL, p. 624.

HARCOURT'S COLOUR TEST.

For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.

The Materials for the above Tests may be obtained from

Mr. S. E. MILLER, 115, Cowley Road, Oxford.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

The LAW GUARANTEE & TRUST SOCIETY, LIMITED,

GUARANTEES FIDELITY.

Send for complete Prospectus, containing Balance-Sheet, Copy of Policy, &c., &c.

HEAD OFFICE:

49, CHANCERY LANE, LONDON, W.C.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.

See Advertisement in last and next issue.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.

Rich in Illuminating Power & Yield of Gas.

Above the average in Weight & Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR Co., Ld.,

CHESTERFIELD.

PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.

MONIER-WILLIAMS & Co.

IRONFOUNDERS,

MIDDLESBROUGH.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

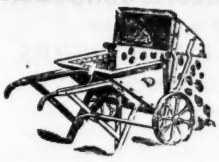
SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,
BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham :—

Specific Gravity (Water 1). . 1·276
Weight of One Cubic Foot. . 79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal . . . . . 2·68 per cent.
Volatile Matter. . . . . 35·60 ,,
Fixed Carbon . . . . . 58·80 ,,
Sulphur . . . . . 0·96 ,,
Ash . . . . . 1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal . . . . 11,760 cub. feet.
Gas per Cubic Foot of Coal . 418 ,,
Illuminating Power . . . . 17·44 candles.
Value of One Cubic Foot in Sperm . . . . . 418 grains.
Value per Ton of Coal in Sperm . . . . . 703 lbs.
Coke per Ton of Coal . . . 1367 ,,
Coke . . . . . 61·05 per cent.
Ash in Coke . . . . . 3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal 9·4 lbs.
Sulphur in Coke per Ton of Coal . . . . . 12 ,,
Ammoniacal Liquor per Ton of Coal . . . . . 19·7 galls.
Tar per Ton of Coal . . . . 12·2 ,,

R. O. PATERSON, C.E.
Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to
THE
Wharncliffe Woodmore Colliery Co
BARNSLEY. LIMITED.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

ALFRED WILLIAMS & Co

(MATTHEW MILDRED)
71, 72 & 73, BANKSIDE,
SOUTHWARK, S.E.
UNIVERSAL PROVIDERS
FOR
GAS, WATER & SEWAGE WORKS
ENGINEERS & CONTRACTORS
FOR THE ERECTION OF COMPLETE GAS AND WATER WORKS, AND FOR RENEWALS AND EXTENSIONS OF EVERY DESCRIPTION.
PLANS & ESTIMATES ON APPLICATION.
MAIN LAYING AND RETORT SETTING.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . . 10,500 Cubic Feet.
Illuminating Power . . 16·9 Candles.
Coke . . . . . 66·7 Coke.
Sulphur . . . . . 0·86 Sulphur.
Ash . . . . . 2·04 Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON AND COAL COMPANY, Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company :—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	PER CENT.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ALEXANDER CAMERON,

CANNEL & GAS COAL MERCHANT

48, WEST REGENT STREET,

GLASGOW.

WORLD'S EXHIBITION AT AMSTERDAM, 1895

Under the High Patronage of H.M. the Queen-Widow, Regent of the Netherlands.

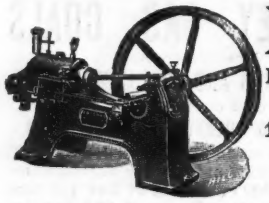
OPENING MAY 1, 1895. CLOSURE NOVEMBER 1, 1895.

Applications are accepted until the 1st of April, 1895.

Group VI. HEALTH. — Group VIII. LIGHTING. — Group X. HEATING.

FOR FURTHER PARTICULARS, PROGRAMMES, &c., APPLY TO

Reuter's International Agency, 25, Old Jewry, E.C., London. The Directors of the Imperial Continental Gas Association, Amsterdam, will furnish all Particulars.



DON'T BE PREJUDICED

Because the prices of Monarch Gas-Engines are so low, but if you are wanting, have one on trial, and prove conclusively that they are the best value on the market.

1½-B.H. Power, with Governors, &c., only £28 10s., less liberal terms. Other sizes to 12-H.P. in proportion. Catalogue of Telephones, Bell Speaking-Tubes, Electric Bells, &c., 4d.

W. H. BAUGHAN & CO., CHARLBURY.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

"CANNELINE"

FOR ENRICHING COAL GAS.

Superior to the very Volatile Hydrocarbons; requiring only a simple apparatus, at quite a nominal cost.

Coal Gas enriched by "CANNELINE" shows conclusively this Hydrocarbon is vastly superior to all other Enriching Agents, including Cannel Coal.

For all Particulars, apply to

S. BOWLEY & SON, Wellington Works, BATTERSEA BRIDGE, LONDON.

OIL GAS

BETTER TERMS CAN BE OBTAINED FROM SUPPLIERS OF OIL IF PURCHASERS HAVE THEIR OWN

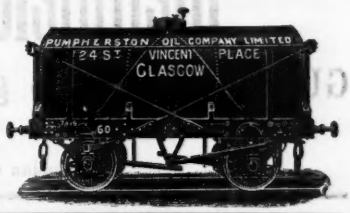
TANK-WAGGONS.

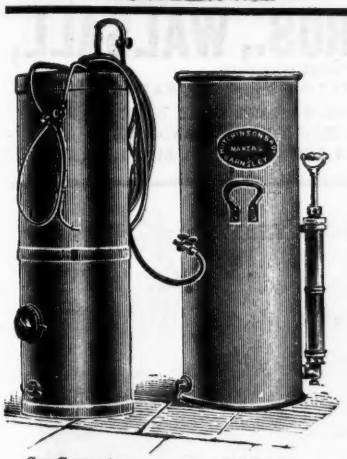
HURST, NELSON, & Co., LTD.,

THE GLASGOW ROLLING STOCK AND PLANT WORKS, MOTHERWELL.

REGISTERED OFFICE:

27, ST. VINCENT PLACE, GLASGOW.





Gas-Generator. Air-Blower.

IMPROVED LEAD-BURNING APPARATUS.

HUTCHINSON BROS.,

GAS ENGINEERS, &c.

SPECIALITY.

LEAD WORK FOR SULPHATE OF AMMONIA PLANTS,

BEST QUALITY OF MATERIAL AND WORKMANSHIP.

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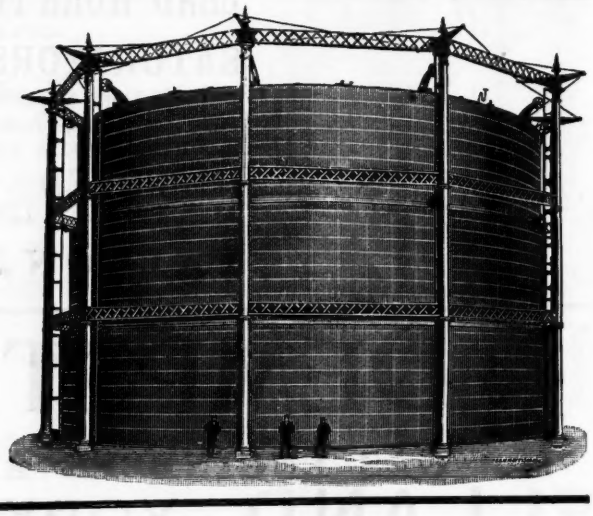

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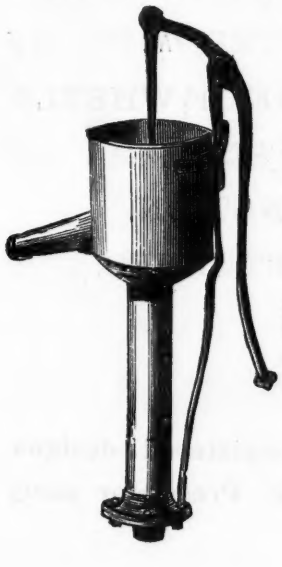

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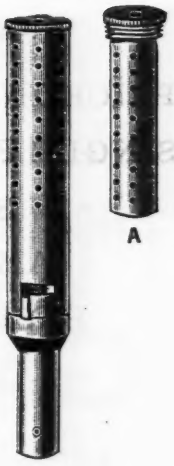

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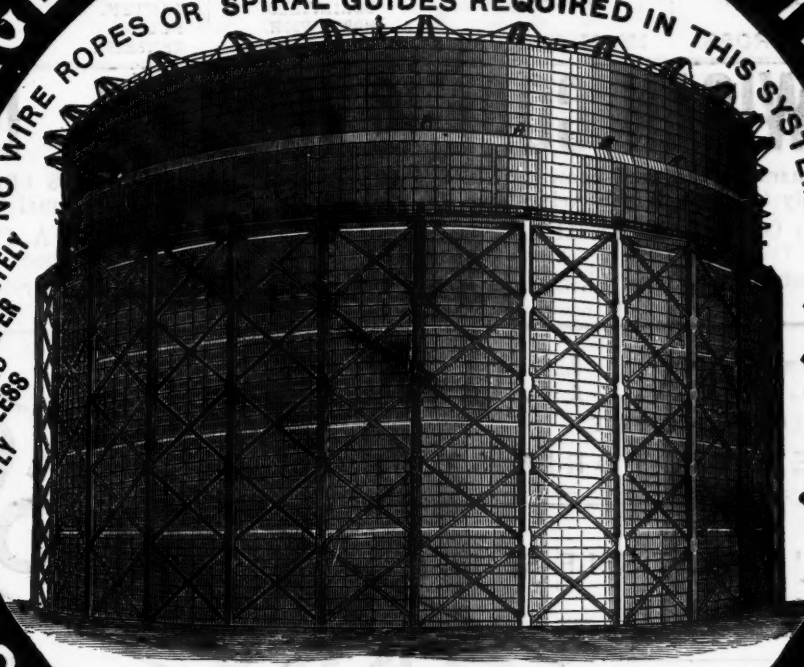

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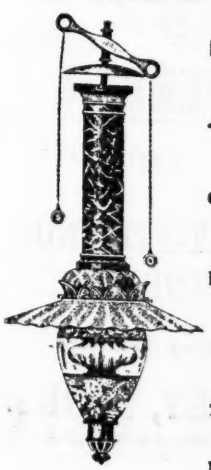

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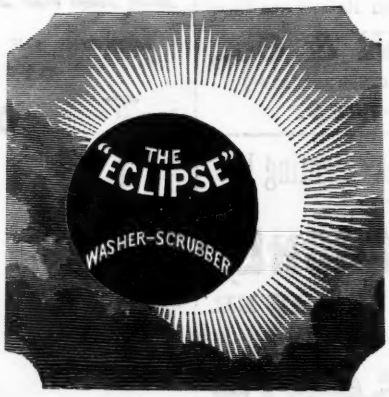

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